KONICA MINOLTA

SERVICE MANUAL

THEORY OF OPERATION

magicolor® 5430 DL
magicolor® 5440 DL
magicolor® 5450

2005.04
KONICA MINOLTA BUSINESS TECHNOLOGIES, INC. Ver. 3.0

SAFETY AND IMPORTANT WARNING ITEMS

Read carefully the Safety and Important Warning Items described below to understand them before doing service work.

IMPORTANT NOTICE

Because of possible hazards to an inexperienced person servicing this product as well as the risk of damage to the product, KONICA MINOLTA BUSINESS TECHNOLOGIES, INC. (hereafter called the KMBT) strongly recommends that all servicing be performed only by KMBT-trained service technicians.
Changes may have been made to this product to improve its performance after this Service Manual was printed. Accordingly, KMBT does not warrant, either explicitly or implicitly, that the information contained in this Service Manual is complete and accurate.
The user of this Service Manual must assume all risks of personal injury and/or damage to the product while servicing the product for which this Service Manual is intended.
Therefore, this Service Manual must be carefully read before doing service work both in the course of technical training and even after that, for performing maintenance and control of the product properly.
Keep this Service Manual also for future service.

DESCRIPTION ITEMS FOR DANGER, WARNING AND CAUTION

In this Service Manual, each of three expressions " ⚠ DANGER", " ⚠ WARNING", and " ⚠ CAUTION" is defined as follows together with a symbol mark to be used in a limited meaning.
When servicing the product, the relevant works (disassembling, reassembling, adjustment, repair, maintenance, etc.) need to be conducted with utmost care.

⚠ **DANGER: Action having a high possibility of suffering death or serious injury**

⚠ **WARNING: Action having a possibility of suffering death or serious injury**

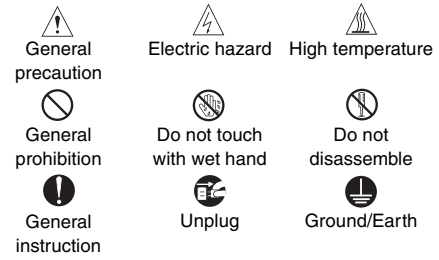
⚠ **CAUTION: Action having a possibility of suffering a slight wound, medium trouble, and property damage**

Symbols used for safety and important warning items are defined as follows:

△ :Precaution when servicing the product.

⃠ :Prohibition when servicing the product.

● :Direction when servicing the product.



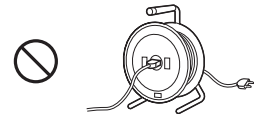
SAFETY WARNINGS

[1] MODIFICATIONS NOT AUTHORIZED BY KONICA MINOLTA BUSINESS TECHNOLOGIES, INC.

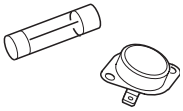
KONICA MINOLTA brand products are renowned for their high reliability. This reliability is achieved through high-quality design and a solid service network.
Product design is a highly complicated and delicate process where numerous mechanical, physical, and electrical aspects have to be taken into consideration, with the aim of arriving at proper tolerances and safety factors. For this reason, unauthorized modifications involve a high risk of degradation in performance and safety. Such modifications are therefore strictly prohibited. the points listed below are not exhaustive, but they illustrate the reasoning behind this policy.

⚠ DANGER : PROHIBITED ACTIONS

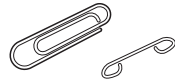
- Using any cables or power cord not specified by KMBT.



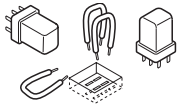
- Using any fuse or thermostat not specified by KMBT. Safety will not be assured, leading to a risk of fire and injury.



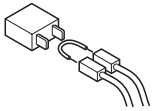
- Disabling fuse functions or bridging fuse terminals with wire, metal clips, solder or similar object.



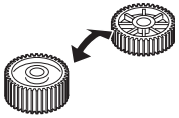
- Disabling relay functions (such as wedging paper between relay contacts)



- Disabling safety functions (interlocks, safety circuits, etc.) Safety will not be assured, leading to a risk of fire and injury.



- Making any modification to the product unless instructed by KMBT
- Using parts not specified by KMBT



[2] CHECKPOINTS WHEN PERFORMING ON-SITE SERVICE

Konica Minolta brand products are extensively tested before shipping, to ensure that all applicable safety standards are met, in order to protect the customer and customer engineer (hereafter called the CE) from the risk of injury. However, in daily use, any electrical equipment may be subject to parts wear and eventual failure. In order to maintain safety and reliability, the CE must perform regular safety checks.

1. Power Supply

⚠ WARNING: Wall Outlet

- Check that mains voltage is as specified. Plug the power cord into the dedicated wall outlet with a capacity greater than the maximum power consumption.

 If excessive current flows in the wall outlet, fire may result.



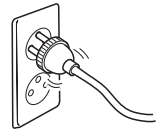
- If two or more power cords can be plugged into the wall outlet, the total load must not exceed the rating of the wall outlet.

 If excessive current flows in the wall outlet, fire may result.

⚠ WARNING: Power Plug and Cord

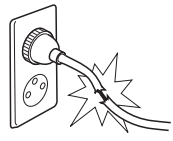
- Make sure the power cord is plugged in the wall outlet securely.

 Contact problems may lead to increased resistance, overheating, and the risk of fire.

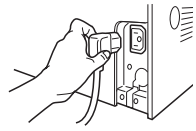


- Check whether the power cord is damaged. Check whether the sheath is damaged.

 If the power plug, cord, or sheath is damaged, replace with a new power cord (with plug and connector on each end) specified by KMBT. Using the damaged power cord may result in fire or electric shock.



- When using the power cord (inlet type) that came with this product, be sure to observe the following precautions:
 a. Make sure the connector is securely inserted in the inlet on the left side panel of the product.
 b. If the power cord or sheath is damaged, replace with a new power cord (with plugs on both ends) specified by KMBT.
 If the power cord (inlet type) is not connected to the product securely, a contact problem may lead to increased resistance, overheating, and risk of fire.

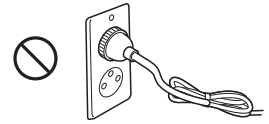


⚠ WARNING: Power Plug and Cord

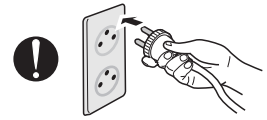
- Check whether the power cord is not stepped on or pinched by a table and so on.
 Overheating may occur there, leading to a risk of fire.



- Do not bundle or tie the power cord.
 Overheating may occur there, leading to a risk of fire.



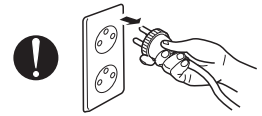
- Check whether dust is collected around the power plug and wall outlet.
 Using the power plug and wall outlet without removing dust may result in fire.



- Do not insert the power plug into the wall outlet with a wet hand.
 The risk of electric shock exists.

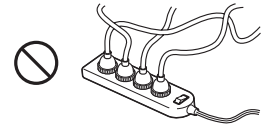


- When unplugging the power cord, grasp the plug, not the cable.
 The cable may be broken, leading to a risk of fire and electric shock.



⚠ WARNING: Wiring

- Never use multi-plug adapters to plug multiple power cords in the same outlet.
 If used, the risk of fire exists.

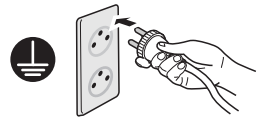


- When an extension cord is required, use a specified one. Current that can flow in the extension cord is limited, so using a too long extension cord may result in fire.
 Do not use an extension cable reel with the cable taken up. Fire may result.



⚠ WARNING: Ground Connection

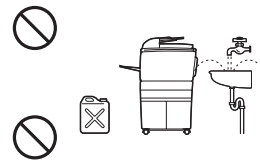
- Check whether the product is grounded properly.
 If current leakage occurs in an ungrounded product, you may suffer electric shock while operating the product. Connect power plug to grounded wall outlet.



2. Installation Requirements

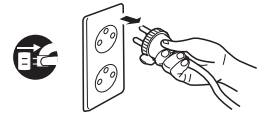
⚠ WARNING: Prohibited Installation Places

- Do not place the product near flammable materials or volatile materials that may catch fire.
 A risk of fire exists.
- Do not place the product in a place exposed to water such as rain.
 A risk of fire and electric shock exists.



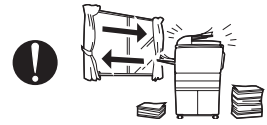
⚠ WARNING: When not Using the Product for a long time

- When the product is not used over an extended period of time (holidays, etc.), switch it off and unplug the power cord.
 Dust collected around the power plug and outlet may cause fire.



⚠ CAUTION: Ventilation

- The product generates ozone gas during operation, but it will not be harmful to the human body.
 If a bad smell of ozone is present in the following cases, ventilate the room.
 a. When the product is used in a poorly ventilated room
 b. When taking a lot of copies
 c. When using multiple products at the same time



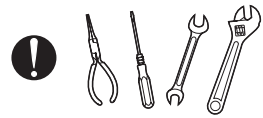
⚠ CAUTION: Stability

- Be sure to lock the caster stoppers.
 In the case of an earthquake and so on, the product may slide, leading to a injury.

⚠ CAUTION: Inspection before Servicing

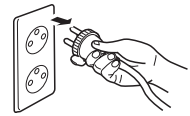
- Before conducting an inspection, read all relevant documentation (service manual, technical notices, etc.) and proceed with the inspection following the prescribed procedure, using only the prescribed tools. Do not make any adjustment not described in the documentation.

 If the prescribed procedure or tool is not used, the product may break and a risk of injury or fire exists.



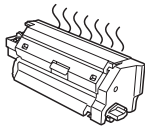
- Before conducting an inspection, be sure to disconnect the power plugs from the product and options.

 When the power plug is inserted in the wall outlet, some units are still powered even if the POWER switch is turned OFF. A risk of electric shock exists.



- The area around the fixing unit is hot.

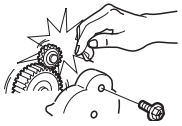
 You may get burnt.



⚠ WARNING: Work Performed with the Product Powered On

- Take every care when making adjustments or performing an operation check with the product powered.

 If you make adjustments or perform an operation check with the external cover detached, you may touch live or high-voltage parts or you may be caught in moving gears or the timing belt, leading to a risk of injury.



- Take every care when servicing with the external cover detached.

 High-voltage exists around the drum unit. A risk of electric shock exists.

⚠ WARNING: Safety Checkpoints

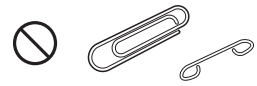
- Check the exterior and frame for edges, burrs, and other damages.

 The user or CE may be injured.

⚠ WARNING: Safety Checkpoints

- Do not allow any metal parts such as clips, staples, and screws to fall into the product.

 They can short internal circuits and cause electric shock or fire.



- Check wiring for squeezing and any other damage.

 Current can leak, leading to a risk of electric shock or fire.

- Carefully remove all toner remnants and dust from electrical parts and electrode units such as a charging corona unit.

 Current can leak, leading to a risk of product trouble or fire.

- Check high-voltage cables and sheaths for any damage.

 Current can leak, leading to a risk of electric shock or fire.



- Check electrode units such as a charging corona unit for deterioration and sign of leakage.

 Current can leak, leading to a risk of trouble or fire.

- Before disassembling or adjusting the write unit (P/H unit) incorporating a laser, make sure that the power cord has been disconnected.

 The laser light can enter your eye, leading to a risk of loss of eyesight.

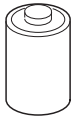


- Do not remove the cover of the write unit. Do not supply power with the write unit shifted from the specified mounting position.

 The laser light can enter your eye, leading to a risk of loss of eyesight.

- When replacing a lithium battery, replace it with a new lithium battery specified in the Parts Guide Manual. Dispose of the used lithium battery using the method specified by local authority.

 Improper replacement can cause explosion.



⚠ WARNING: Safety Checkpoints

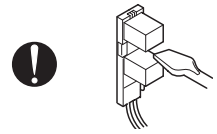
- After replacing a part to which AC voltage is applied (e.g., optical lamp and fixing lamp), be sure to check the installation state.

 A risk of fire exists.



- Check the interlock switch and actuator for loosening and check whether the interlock functions properly.

 If the interlock does not function, you may receive an electric shock or be injured when you insert your hand in the product (e.g., for clearing paper jam).



- Make sure the wiring cannot come into contact with sharp edges, burrs, or other pointed parts.

 Current can leak, leading to a risk of electric shock or fire.



- Make sure that all screws, components, wiring, connectors, etc. that were removed for safety check and maintenance have been reinstalled in the original location. (Pay special attention to forgotten connectors, pinched cables, forgotten screws, etc.)

 A risk of product trouble, electric shock, and fire exists.



⚠ WARNING: HANDLING OF CONSUMABLES

- Toner and developer are not harmful substances, but care must be taken not to breathe excessive amounts or let the substances come into contact with eyes, etc. It may be stimulative.

 If the substances get in the eye, rinse with plenty of water immediately. When symptoms are noticeable, consult a physician.



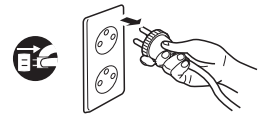
- Never throw the used cartridge and toner into fire.

 You may be burned due to dust explosion.



⚠ CAUTION: HANDLING OF SERVICE MATERIALS

- Unplug the power cord from the wall outlet.
 Drum cleaner (isopropyl alcohol) and roller cleaner (acetone-based) are highly flammable and must be handled with care. A risk of fire exists.



- Do not replace the cover or turn the product ON before any solvent remnants on the cleaned parts have fully evaporated.
 A risk of fire exists.



- Use only a small amount of cleaner at a time and take care not to spill any liquid. If this happens, immediately wipe it off.
 A risk of fire exists.

- When using any solvent, ventilate the room well.
 Breathing large quantities of organic solvents can lead to discomfort.



[3] MEASURES TO TAKE IN CASE OF AN ACCIDENT

1. If an accident has occurred, the distributor who has been notified first must immediately take emergency measures to provide relief to affected persons and to prevent further damage.
2. If a report of a serious accident has been received from a customer, an on-site evaluation must be carried out quickly and KMBT must be notified.
3. To determine the cause of the accident, conditions and materials must be recorded through direct on-site checks, in accordance with instructions issued by KMBT.

[4] CONCLUSION

1. Safety of users and customer engineers depends highly on accurate maintenance and administration. Therefore, safety can be maintained by the appropriate daily service work conducted by the customer engineer.
2. When performing service, each product on the site must be tested for safety. The customer engineer must verify the safety of parts and ensure appropriate management of the equipment.

[5] Laser Safety

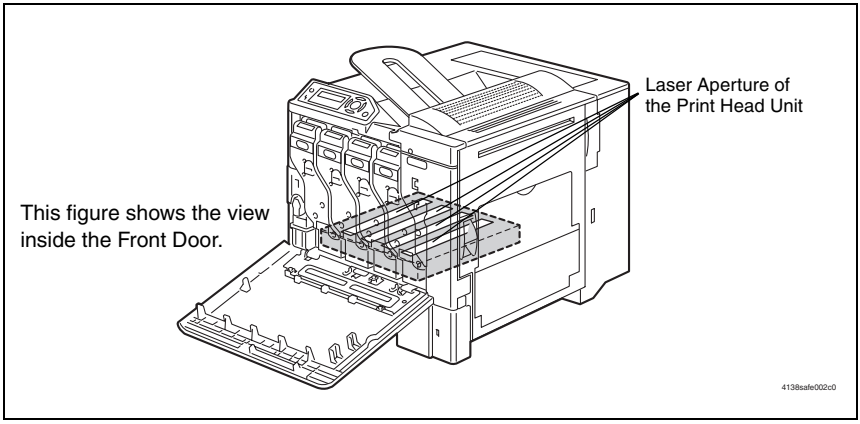
- This is a digital machine certified as a class 1 laser product. There is no possibility of danger from a laser, provided the machine is serviced according to the instruction in this manual.

5.1 Internal Laser Radiation

semiconductor laser	
Maximum power of the laser diode	15 mW
Maximum average radiation power (*)	7.2 µW
Wavelength	770-800 nm

*:at laser aperture of the Print Head Unit

- This product employs a Class 3b laser diode that emits an invisible laser beam. The laser diode and the scanning polygon mirror are incorporated in the print head unit.
- The print head unit is NOT A FIELD SERVICEABLE ITEM. Therefore, the print head unit should not be opened under any circumstances.



the U.S.A., Canada
(CDRH Regulation)

- This machine is certified as a Class I Laser product under Radiation Performance Standard according to the Food, Drug and Cosmetic Act of 1990. Compliance is mandatory for Laser products marketed in the United States and is reported to the Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration of the U.S. Department of Health and Human Services (DHHS). This means that the device does not produce hazardous laser radiation.

- The label shown to page 14 indicates compliance with the CDRH regulations and must be attached to laser products marketed in the United States.

CAUTION
- **Use of controls, adjustments or performance of procedures other than those specified in this manual may result in hazardous radiation exposure.**

semiconductor laser	
Maximum power of the laser diode	15 mW
Wavelength	770-800 nm

All Areas

CAUTION
- **Use of controls, adjustments or performance of procedures other than those specified in this manual may result in hazardous radiation exposure.**

semiconductor laser	
Maximum power of the laser diode	15 mW
Wavelength	770-800 nm

Denmark

ADVARSEL
- **Usynlig laserstråling ved åbning, når sikkerhedsafbrydere er ude af funktion. Undgå udsættelse for stråling. Klasse 1 laser produkt der opfylder IEC60825-1 sikkerheds kravene.**

halvlederlaser	
Laserdiodens højeste styrke	15 mW
bølgelængden	770-800 nm

Finland, Sweden

LUOKAN 1 LASERLAITE
KLASS 1 LASER APPARAT

VAROITUS!
- **Laitteen käyttäminen muulla kuin tässä käyttöohjeessa mainitulla tavalla saattaa altistaa käyttäjän turvallisuusluokan 1 ylittävälle näkymättömälle lasersäteilylle.**

puolijohdelaser	
Laserdiodin suurin teho	15 mW
aallonpituus	770-800 nm

VARNING!
- **Om apparaten används på annat sätt än i denna bruksanvisning specificerats, kan användaren utsättas för osynlig laserstrålning, som överskrider gränsen för laserklass 1.**

halvledarlaser	
Den maximala effekten för laserdioden	15 mW
våglängden	770-800 nm

VARO!
- **Avattaessa ja suojalukitus ohitettaessa olet alttiina näkymättomälle lasersäteilylle. Älä katso säteeseen.**

VARNING!
- **Osynlig laserstråining när denna del är öppnad och spärren är urkopplad. Betrakta ej stråien.**

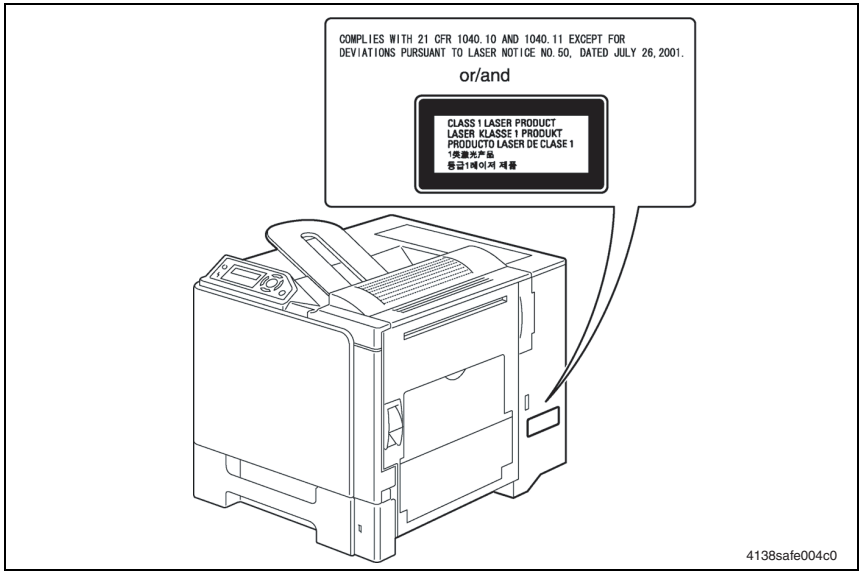
Norway

ADVERSEL
- **Dersom apparatet brukes på annen måte enn spesifisert i denne bruksanvisning, kan brukeren utsettes för unsynlig laserstrålning, som overskrider grensen for laser klass 1.**

halvleder laser	
Maksimal effekt till laserdiode	15 mW
bølgelengde	770-800 nm

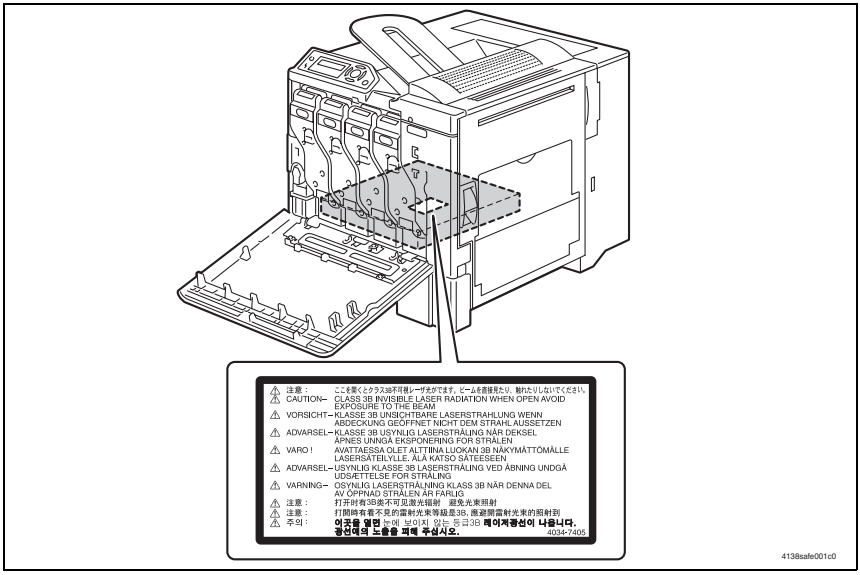
5.2 Laser Safety Label

- A laser safety label is attached to the the machine as shown below.



5.3 Laser Caution Label

- A laser caution label is attached to the inside of the machine as shown below.

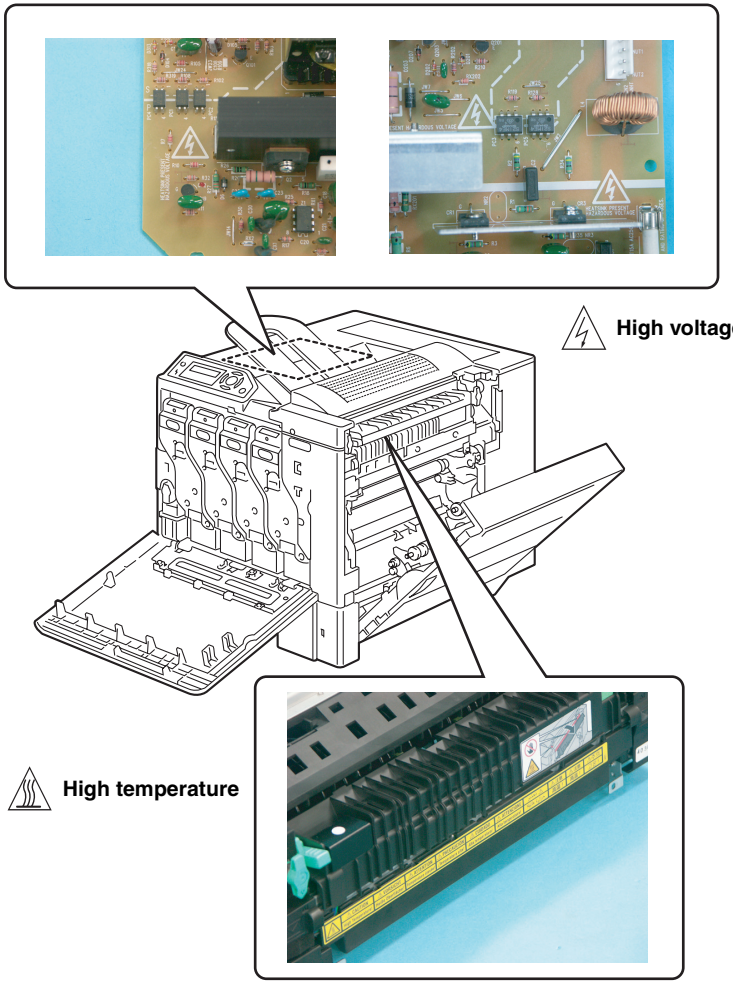


5.4 PRECAUTIONS FOR HANDLING THE LASER EQUIPMENT

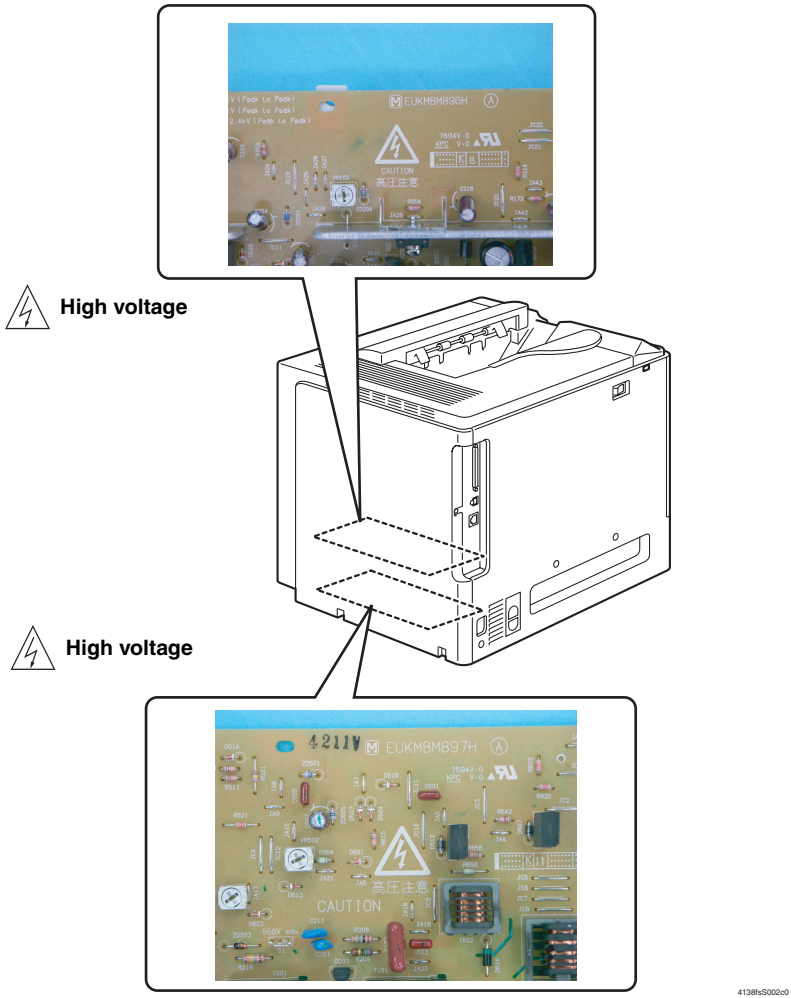
- When laser protective goggles are to be used, select ones with a lens conforming to the above specifications.
- When a disassembly job needs to be performed in the laser beam path, such as when working around the printerhead and PC Drum, be sure first to turn the printer OFF.
- If the job requires that the printer be left ON, take off your watch and ring and wear laser protective goggles.
- A highly reflective tool can be dangerous if it is brought into the laser beam path. Use utmost care when handling tools on the user's premises.
- The Print Head are not to be disassembled or adjusted in the field. Replace the Unit or Assembly including the Control Board. Therefore, remove the Laser Diode, and do not perform Control Board trimmer adjustment.

WARNING INDICATIONS ON THE MACHINE

Caution labels shown are attached in some areas on/in the machine.
When accessing these areas for maintenance, repair, or adjustment, special care should be taken to avoid burns and electric shock.



4138fsS001c0


High voltage
High voltage
EUKMBM896H
EUKMBM897H
CAUTION
高圧注意
4138fsS002c0

KONICA MINOLTA

SERVICE MANUAL THEORY OF OPERATION

magicolor® 5430 DL
magicolor® 5440 DL
magicolor® 5450
Main Unit

2005.04
KONICA MINOLTA BUSINESS TECHNOLOGIES, INC. Ver. 3.0

CONTENTS

I Outline

1. System configuration 1-1
2. Product specifications 1-2
 - 2.1 Type 1-2
 - 2.2 Functions 1-3
 - 2.3 Maintenance 1-5
 - 2.4 Machine Specifications 1-5
 - 2.5 Operating Environment 1-5
3. Center cross section 1-6
4. Paper path 1-7
5. Image creation process 1-8

II Composition/Operation

1. Overall composition 2-1
 - 1.1 Timing chart at machine powerup 2-1
 - 1.2 Control block diagram 2-2
2. Print head (PH) 2-3
 - 2.1 Composition 2-3
 - 2.2 Operation 2-4
 - 2.2.1 Overview 2-4
 - 2.2.2 Laser exposure process 2-4
 - 2.2.3 Laser emission timing 2-5
 - 2.2.4 Laser emission area 2-5
 - 2.2.5 Laser light intensity control 2-6
 - 2.2.6 Registration correction control 2-6
3. Toner Cartridge (TC) / TC Overall composition 2-7
 - 3.1 Composition 2-7
 - 3.2 Drive 2-10
 - 3.3 Operation 2-12
 - 3.3.1 Configuration of Toner Cartridge 2-12
 - 3.3.2 Loading/unloading mechanism of Toner Cartridge 2-12
 - 3.3.3 Toner Cartridge life control 2-13
4. Toner Cartridge / Hopper 2-14
 - 4.1 Composition 2-14
 - 4.2 Operation 2-15
 - 4.2.1 Toner Level Detection (magicolor 5430DL/5440DL) 2-15
 - 4.2.2 Toner Level Detection (magicolor 5450) 2-15

4.2.3 Toner near-empty condition detection 2-15
4.2.4 Toner empty condition detection 2-17
4.2.5 Toner replenishing mechanism/control 2-19
5. Toner Cartridge / Photo Conductor 2-22
5.1 Composition 2-22
5.2 Operation 2-22
5.2.1 Photo Conductor drive mechanism 2-22
5.2.2 Photo Conductor post-exposure control 2-23
5.2.3 Photo Conductor total exposure control upon recovery 2-23
5.2.4 Photo Conductor small amount rotation control 2-24
6. Toner Cartridge / Charge corona section 2-25
6.1 Composition 2-25
6.2 Operation 2-26
6.2.1 Charge Corona Unit ON/OFF control 2-26
6.2.2 Output during pre-process 2-26
6.2.3 Output during post-process 2-26
6.2.4 Ozone ventilation mechanism 2-27
7. Toner Cartridge / Developing Unit 2-28
7.1 Composition 2-28
7.2 Operation 2-30
7.2.1 Developing drive control 2-30
7.2.2 Toner flow 2-31
7.2.3 Developing system 2-32
7.2.4 Developing bias Vpp control (Ds compensation control) 2-33
7.2.5 Developing bias duty control (compensation control of the maximum amount of toner sticking to the Transfer Belt) 2-34
7.2.6 Gamma correction control 2-35
7.2.7 Cleaning mechanism 2-36
8. 1st transfer section 2-37
8.1 Composition 2-37
8.2 Drive 2-39
8.3 Operation 2-40
8.3.1 Transfer Belt speed control 2-40
8.3.2 1st transfer output control 2-40
8.3.3 1st Transfer Roller pressure/retraction control 2-41
8.3.4 1st Transfer Roller pressure/retraction failure detection control 2-44
8.3.5 Transfer Belt cleaning 2-45
8.3.6 Toner Collecting Port Shutter mechanism 2-46
9. 2nd transfer section 2-47

9.1 Composition 2-47
9.1.1 Drive 2-48
9.2 Operation 2-49
9.2.1 2nd Transfer Roller pressure mechanism 2-49
9.2.2 2nd Transfer Roller pressure position deviation preventive mechanism 2-51
9.2.3 2nd transfer voltage control 2-51
9.2.4 2nd transfer voltage setting control (ATVC: Auto Transfer Voltage Control) 2-52
9.2.5 2nd transfer voltage fine-adjustment control 2-53
9.2.6 2nd Transfer Roller pressure/retraction failure detection control 2-53
9.2.7 2nd Transfer Roller cleaning control 2-53
9.2.8 2nd Transfer Roller cleaning operation timing 2-54
10. Toner collecting section 2-55
10.1 Composition 2-55
10.2 Drive 2-56
10.3 Operation 2-57
10.3.1 Toner collecting mechanism 2-57
10.3.2 Toner Collecting Port Shutter mechanism 2-57
10.3.3 Waste Toner Box locking mechanism 2-58
10.3.4 Waste Toner Box locked position detection mechanism 2-58
10.3.5 Waste Toner Box-in-position detection mechanism 2-58
10.3.6 Waste toner near-full condition detection 2-59
10.3.7 Waste toner full condition detection control 2-61
11. AIDC Sensor 2-63
11.1 Composition 2-63
11.1.1 Drive 2-64
11.2 Operation 2-64
11.2.1 Toner density detection control 2-64
11.2.2 AIDC Sensor calibration control 2-65
11.2.3 AIDC Sensor shutter mechanism 2-66
12. Paper feed section (magicolor 5430 DL) 2-67
12.1 Composition 2-67
12.2 Drive 2-68
12.3 Operation 2-69
12.3.1 Paper Lift Plate mechanism 2-69
12.3.2 Paper separation mechanism 2-69
12.3.3 Paper feed control 2-70
12.3.4 Paper supply level detection control 2-70
12.3.5 Paper empty condition detection control 2-71

12.3.6 Edge Guide Plate 2-71
12.3.7 Trailing Edge Guide Plate 2-71
12.3.8 Paper size detection control 2-72
12.3.9 Paper misfeed detection control 2-72
13. Paper feed section (magicolor 5440DL/5450) 2-73
13.1 Composition 2-73
13.2 Drive 2-74
13.3 Operation 2-74
13.3.1 Paper Lift Plate mechanism 2-74
13.3.2 Paper separation mechanism 2-75
13.3.3 Paper feed control 2-75
13.3.4 Paper supply level detection control 2-76
13.3.5 Paper empty condition detection control 2-76
13.3.6 Edge Guide Plate 2-77
13.3.7 Trailing Edge Guide Plate 2-77
13.3.8 Tray detection control 2-78
13.3.9 Paper misfeed detection control 2-78
14. Manual feed section (magicolor 5440DL/5450) 2-79
14.1 Composition 2-79
14.2 Drive 2-80
14.3 Operation 2-81
14.3.1 Paper Lift Plate mechanism 2-81
14.3.2 Paper separation mechanism 2-82
14.3.3 Paper feed control 2-82
14.3.4 Paper empty condition detection control 2-83
14.3.5 Edge Guide Plate 2-83
14.3.6 Paper misfeed detection control 2-84
15. Conveyance section 2-85
15.1 Composition 2-85
15.2 Drive 2-86
15.3 Operation 2-87
15.3.1 Conveyance speed control 2-87
15.3.2 Synchronizing Roller control 2-87
15.3.3 Control of loop formed before Synchronizing Roller 2-88
15.3.4 Control of loop formed before 2nd transfer 2-89
15.3.5 Control of loop formed before fusing section 2-90
15.3.6 Paper neutralization 2-91
15.3.7 OHP film detection control 2-91

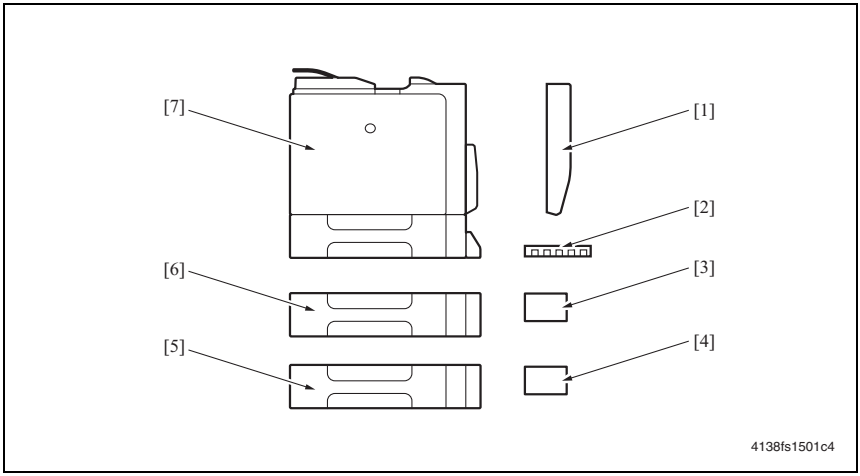
15.3.8 Size error detection control 2-92
15.3.9 Conveyance system paper misfeed detection control 2-93
15.3.10 Control of detection of paper left in conveyance system 2-94
15.3.11 Control of detection of paper left in machine upon stoppage of paper conveyance 2-95
15.3.12 Temperature/humidity Sensor 2-95
16. Fusing section 2-96
16.1 Composition 2-96
16.2 Drive 2-98
16.3 Operation 2-99
16.3.1 Fusing Pressure Roller pressure selection mechanism 2-99
16.3.2 Fusing Pressure Roller drive control 2-99
16.3.3 Fusing temperature control 2-104
16.3.4 Fusing temperature control management 2-105
16.3.5 Warm-up control 2-106
16.3.6 Post-warm-up control 2-108
16.3.7 Wait control 2-108
16.3.8 Print control 2-109
16.3.9 Post-print control 2-110
16.3.10 Heater OFF control 2-110
16.3.11 Heater control 2-111
16.3.12 PPM control 2-111
16.4 Malfunction detection 2-112
16.4.1 Fusing Unit malfunctions 2-112
16.4.2 Fusing Motor abnormal rotation detection control 2-112
16.4.3 Warm-up failure detection control 2-113
16.4.4 Abnormally low temperature detection control 2-113
16.4.5 Abnormally high temperature detection control 2-114
16.4.6 Open-circuited Heating Roller Thermistor (incorrect installation) detection control 2-114
16.4.7 Open-circuited Fusing Pressure Roller Thermistor (incorrect installation) detection control 2-115
16.4.8 Abnormal temperature increase rate detection control 2-115
16.4.9 Protection against abnormally high temperature 2-116
17. Image stabilization control 2-118
17.1 Overview of image stabilization control 2-118
17.1.1 Complete correction control 2-118
17.1.2 Simplified correction control 2-119
17.1.3 Image stabilization control execution request 2-120

17.1.4 Conditions enabling execution of stabilization control at the end of a print cycle of given conditions 2-120
17.1.5 Combination and execution sequence of different sub-controls 2-121
17.2 Operation flow of image stabilization control upon replacement of unit 2-122
18. Miscellaneous 2-123
18.1 Fan control 2-123
18.1.1 Composition 2-123
18.1.2 Control 2-124

I Outline

1. System Configuration

System Front View



[1]	Duplex Option	[5]	Optional Lower Feeder Unit
[2]	Optional DIMM	[6]	Optional Lower Feeder Unit
[3]	Optional Camera Direct Photo Print Card (magicolor 5440 DL only)	[7]	Main Unit
[4]	Optional Hard Disk Drive (HDD) (magicolor 5450 only)		

2. Product Specifications

2.1 Type

Type	Desktop tandem full-color laser beam printer
Printing System	Semiconductor laser and electrostatic image transfer to plain paper
Exposure System	4 laser diode and polygon mirror
PC Drum Type	OPC (organic photo conductor)
Photoconductor Cleaning	Blade cleaning system
Print Density	magicolor 5430 DL/5440 DL 2400 x 600 dpi x 1 bit, 1200 x 600 dpi x 1 bit, 600 x 600 dpi x 1 bit
	magicolor 5450 600 x 600 dpi x 4 bit
Paper Feeding System	magicolor 5430 DL One-way system (Tray 1: 250 sheets) * Expandable up to a three-way system by adding optional Lower Feeder Units (up to two)
	magicolor 5440 DL Two-way system (Tray 1: 500 sheets, Manual Feed Tray: 100 sheets) * Expandable up to a four-way system by adding optional Lower Feeder Units (up to two)
	magicolor 5450 Two-way system (Tray 1: 100 sheets, Tray 2: 500 sheets) * Expandable up to a four-way system by adding optional Lower Feeder Units (up to two)
Developing System	Single-element developing system
Charging System	DC comb electrode Scorotron system
Image Transfer System	Intermediate transfer belt system
Paper Separating System	Curvature separation + charge-neutralizing system
Fusing System	Belt fusing
Paper Exit System	Face down (Output Tray capacity: 250 sheets)

2.2 Functions

Warm-up Time	Average: 30 sec. or less (at ambient temperature of 23° C/73.4° F and rated source voltage)
System Speed	152 mm/sec (Plain Paper)
First-Page-Out Time (Plain Paper)	1-sided: 14.2 seconds; 2-sided: 22.3 seconds (A4) 1-sided: 14.1 seconds; 2-sided: 22.3 seconds (Letter)
Print Speed (Plain Paper)	magicolor 5430 DL 1-sided: 20 pages/min; 2-sided: 11.5 pages/min (A4) 1-sided: 21 pages/min; 2-sided: 11.8 pages/min (Letter) * When feeding the paper from Tray1
	magicolor 5440 DL 1-sided: 25.6 pages/min; 2-sided: 12.3 pages/min (A4) 1-sided: 27 pages/min; 2-sided: 12.5 pages/min (Letter) * When feeding the paper from Tray1
	magicolor 5450 1-sided: 25.6 pages/min; 2-sided: 12.3 pages/min (A4) 1-sided: 27 pages/min; 2-sided: 12.5 pages/min (Letter) * When feeding the paper from Tray 2
Custom Paper Sizes	magicolor 5430 DL Paper width: 92 to 216 mm (3.6 to 8.5 inch) (Tray 1) Paper length: 148 to 297 mm (5.8 to 11.7 inch) (Tray 1)
	magicolor 5440 DL Paper width: 92 to 216 mm (3.6 to 8.5 inch) (Manual Feed Tray) Paper length: 148 to 356 mm (5.8 to 14.0 inch) (Manual Feed Tray)
	magicolor 5450 Paper width: 92 to 216 mm (3.6 to 8.5 inch) (Tray 1) Paper length: 148 to 355.6 mm (5.8 to 14.0 inch) (Tray 1)
Media Types	magicolor 5430 DL Tray 1 • Plain paper (60 to 90 g/m^2 / 16 to 24 lb) • Recycled paper (60 to 90 g/m^2 / 16 to 24 lb) • OHP transparencies • Thick stock 1 (91 to 150 g/m^2/ 24 to 40 lb) • Thick stock 2 (151 to 210 g/m^2/ 41 to 56 lb) • Postcards • Double postcards (Print before folding) • Envelopes • Letterhead • Labels

Media Types	magicolor 5440 DL Tray 1 • Plain paper (60 to 90 g/m^2 / 16 to 24 lb) • Recycled paper (60 to 90 g/m^2 / 16 to 24 lb) Manual Feed Tray • Plain paper (60 to 90 g/m^2 / 16 to 24 lb) • Recycled paper (60 to 90 g/m^2 / 16 to 24 lb) • OHP transparencies • Thick stock 1 (91 to 150 g/m^2/ 24 to 40 lb) • Thick stock 2 (151 to 210 g/m^2/ 41 to 56 lb) • Postcards • Double postcards (Print before folding) • Envelopes • Letterhead • Labels
	magicolor 5450 Tray 1 • Plain paper (60 to 90 g/m^2 / 16 to 24 lb) • Recycled paper (60 to 90 g/m^2 / 16 to 24 lb) • OHP transparencies • Thick stock 1 (91 to 150 g/m^2/ 24 to 40 lb) • Thick stock 2 (151 to 210 g/m^2/ 41 to 56 lb) • Postcards • Double postcards (Print before folding) • Envelopes • Letterhead • Labels Tray 2 • Plain paper (60 to 90 g/m^2 / 16 to 24 lb) • Recycled paper (60 to 90 g/m^2 / 16 to 24 lb)
Tray Capacities	magicolor 5430 DL Plain paper and recycled paper: 250 sheets (Tray 1) Letterhead: 150 sheets (Tray 1) Transparencies, thick stock 1, thick stock 2, postcards, double postcards, and labels: 20 sheets (Tray 1) Envelopes: 10 sheets (Tray 1)
	magicolor 5440 DL Plain paper and recycled paper: 500 sheets (Tray 1) Plain paper and recycled paper: 100 sheets (Manual Feed Tray) Transparencies, thick stock 1, thick stock 2, postcards, double postcards, letterhead, and labels: 20 sheets (Manual Feed Tray) Envelopes: 10 sheets (Manual Feed Tray)
	magicolor 5450 Plain paper and recycled paper: 100 sheets (Tray 1) Transparencies, thick stock 1, thick stock 2, postcards, double postcards, letterhead, and labels: 20 sheets (Tray 1) Envelopes: 10 sheets (Tray 1) Plain paper and recycled paper: 500 sheets (Tray 2)

Interfaces	magicolor 5430 DL/5440 DL • USB 2.0 (High-Speed) compliant • 10 Base-T/100 Base-TX (IEEE 802.3) Ethernet • The magicolor 5440 DL also has a Host USB port, which supports Camera Direct Photo Printing from PictBridge-enabled cameras when an optional Camera Direct Photo Print Card is installed.
	magicolor 5450 • Parallel (IEEE 1284) Support only an ECP mode • USB 2.0 (High-Speed) compliant • 10 Base-T/100 Base-TX/1000 Base-T (IEEE 802.3) Ethernet
CPU	magicolor 5430 DL/5440 DL ARM9 956EJ-S 200 MHz
	magicolor 5450 Motorola PowerPC 7447A 667 MHz
Standard memory	magicolor 5430 DL/5440 DL 64 MB (Expandable up to a 576 MB)
	magicolor 5450 256 MB (Expandable up to a 1024 MB)
Hard disk	Optional (magicolor 5450 only) 40 GB

Lower Feeder Unit: Only plain paper and recycled paper weighing 60 to 90 g/m^2 (16 to 24 lb) can be loaded.

Duplex Option: Only plain paper and recycled paper weighing 60 to 90 g/m^2 (16 to 24 lb) can be fed through the unit.

☞ For details, see the Service Manual for each option.

2.3 Maintenance

Machine Durability	400,000 prints or 5 years, whichever comes first

2.4 Machine Specifications

Power Requirements Voltage:	AC 110 to 127 V AC 220 to 240 V
Frequency:	50/60 Hz ± 3 Hz
Max Power Consumption	1250 W
Dimensions	420 mm (W) x 520 mm (D) x 440 mm (H) 16.5 inch (W) x 20.5 inch (D) x 17.3 inch (H)
Weight	magicolor 5430 DL Approx. 30 kg (66.25 lb) without TC
	magicolor 5440 DL/5450 Approx. 31 kg (66.25 lb) without TC
Operating Noise	During standby : 39 dB (A) or less During printing : 54 dB (A) or less

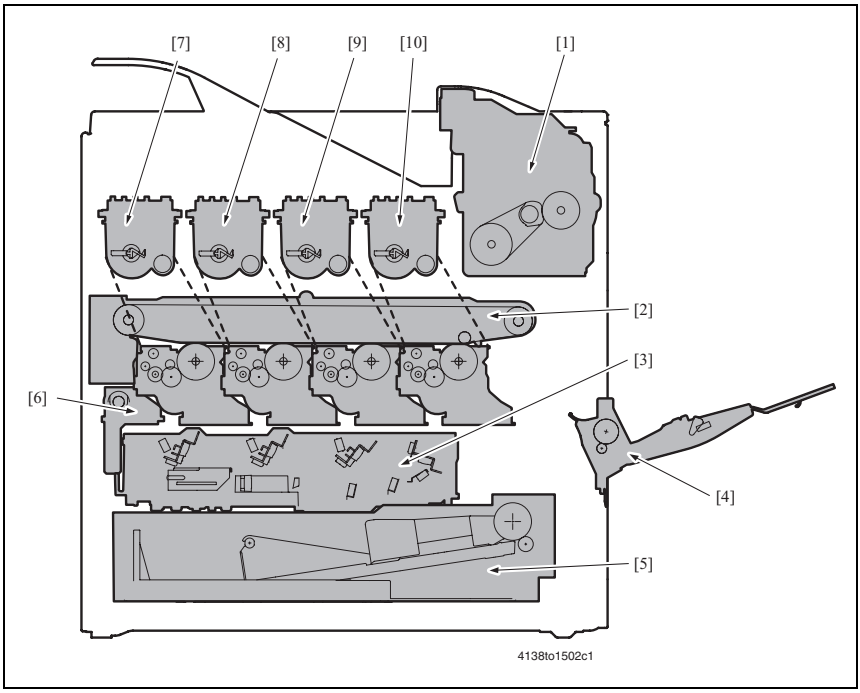
2.5 Operating Environment

Temperature	10° to 35° C / 50° to 95° F (with a fluctuation of 10° C / 18° F or less per hour)
Humidity	15% to 85% (with a fluctuation of 20%/h)

NOTE

- **These specifications are subject to change without notice.**

3. Center Cross Section



[1]	Fusing Unit	[6]	Waste Toner Box
[2]	Transfer Belt Unit	[7]	Toner Cartridge /Y
[3]	Print head Unit	[8]	Toner Cartridge /M
[4]	Manual Feed Tray (magicolor 5440 DL only) Tray 1 (magicolor 5450 only)	[9]	Toner Cartridge /C
		[10]	Toner Cartridge /K
[5]	Tray 1 (magicolor 5430 DL/5440 DL) Tray 2 (magicolor 5450)		

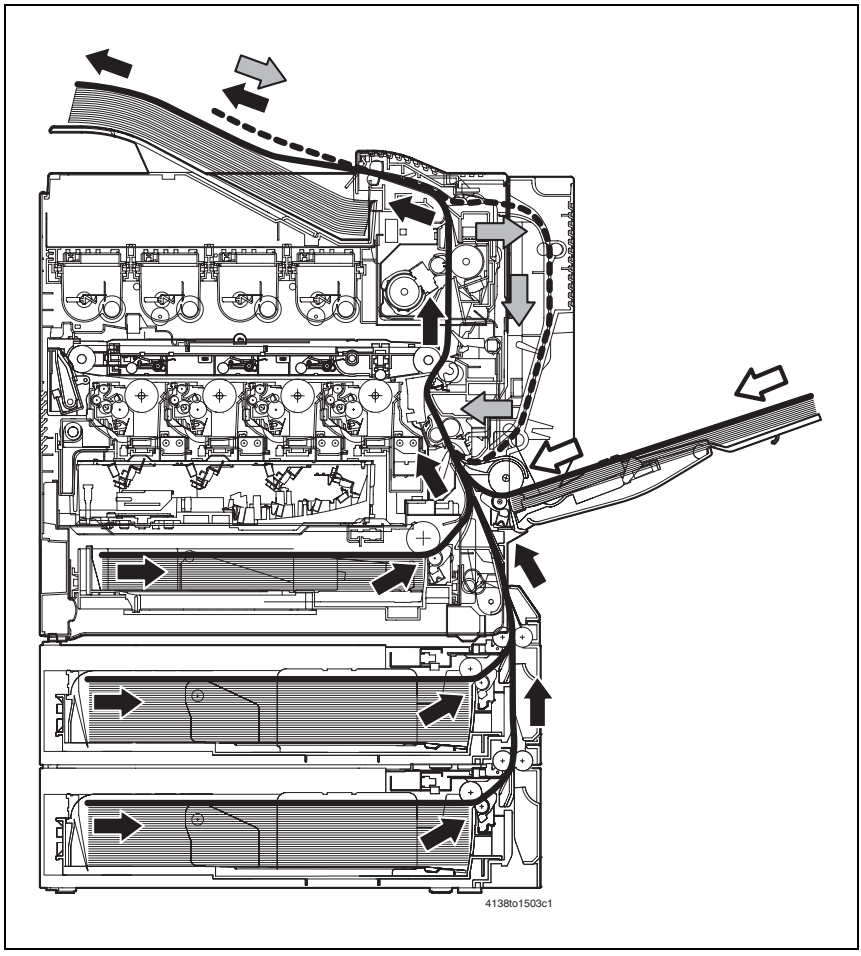
NOTE

- **Be sure to note that feed trays [4] and [5] are named differently depending upon the printer model.**

magicolor 5430 DL / 5440 DL	magicolor 5450
MANUAL FEED TRAY	TRAY1
TRAY1	TRAY2
TRAY2	TRAY3
TRAY3	TRAY4

- **Throughout this manual, the magicolor 5430 DL/5440 DL names are used for these trays.**

4. Paper Path

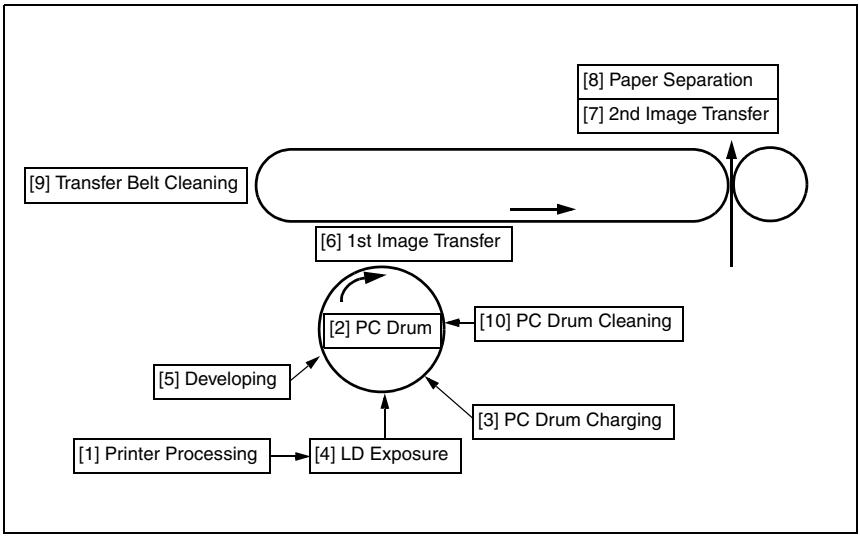


1-sided paper path

2-sided paper path

1-sided paper path from the Manual Feed Tray (magicolor 5440 DL/5450 only)

5. Image Creation Process



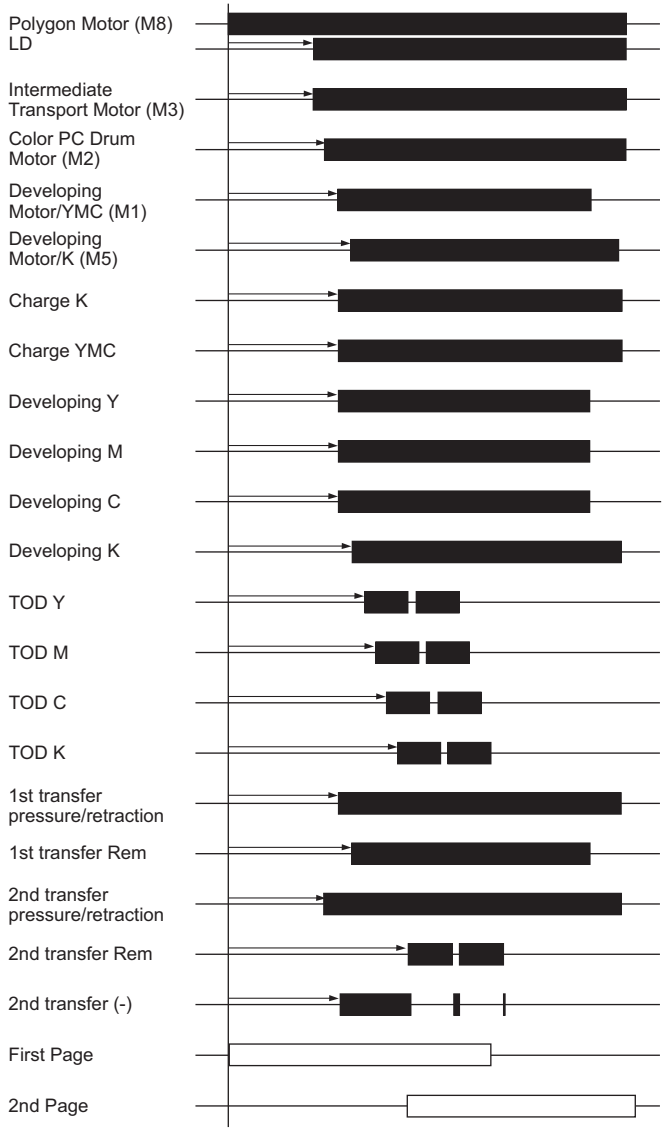
[1]	Printer Processing	• The intensity of the laser light is controlled based on the image signal transmitted from the host computer.
[2]	PC Drum	• The image of the original projected onto the surface of the PC Drum is changed to a corresponding electrostatic latent image.
[3]	PC Drum Charging	• Apply DC (-) charge to the photo conductor.
[4]	LD Exposure	• The surface of the PC Drum is irradiated with laser light, and an electrostatic latent image is thereby formed.
[5]	Developing	• The toner, agitated and negatively charged in the Toner Chamber, is attracted onto the electrostatic latent image formed on the surface of the PC Drum. It is thereby changed to a visible, developed image.
[6]	1st Image Transfer	• A DC positive voltage is applied to the backside of the Transfer Belt, thereby allowing the visible, developed image on the surface of each of the PC Drums (Y, M, C and K) to be transferred onto the Transfer Belt.
[7]	2nd Image Transfer	• A DC positive voltage is applied to the backside of the paper, thereby allowing the visible, developed image on the surface of the Transfer Belt to be transferred onto the paper.
[8]	Paper Separation	• The paper, which has undergone the 2nd image transfer process, is neutralized so that it can be properly separated from the Transfer Belt.
[9]	Transfer Belt Cleaning	• The residual toner left on the surface of the Transfer Belt is scraped off.
[10]	PC Drum Cleaning	• The residual toner left on the surface of the PC Drum is scraped off.

II Composition/Operation

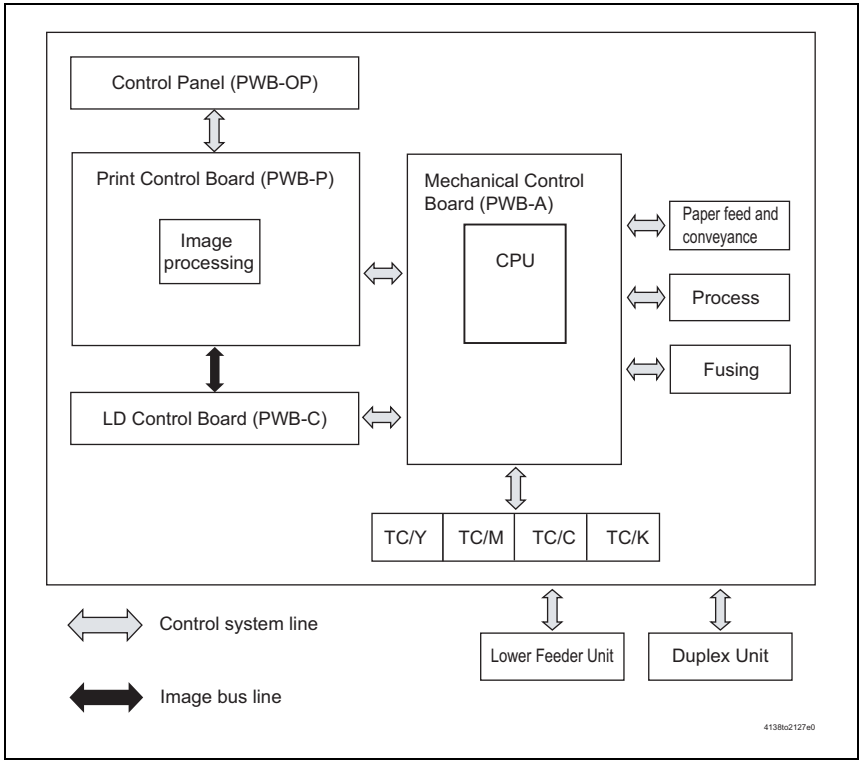
1. Overall Composition

1.1 Timing chart at machine powerup

Conditions: A4 plain paper, 2 printed pages/job

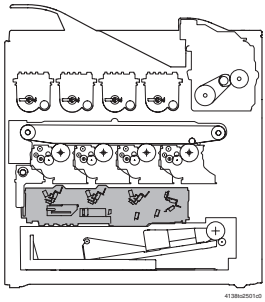


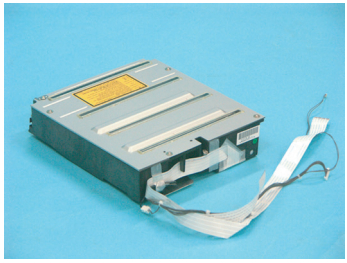
1.2 Control block diagram



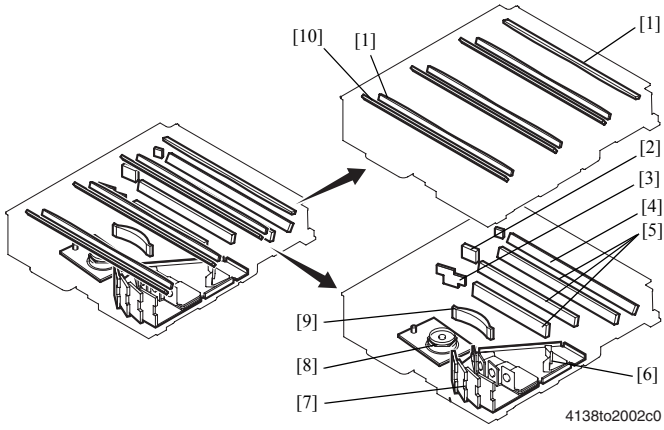
2. Print Head (PH)

2.1 Composition





4138to2001c0



4138to2002c0

Key	Name	Function/system
[1]	G2 Lens/Y, M, C, K	• Condenses the incident laser light and irradiates the K Photo Conductor or Return Mirror/2nd of each color with the condensed laser light.
[2]	SOS Lens	• Condenses the incident laser light/K onto the SOS Sensor.
[3]	SOS Sensor	• Generates an SOS signal based on the incident laser light/K.
[4]	Separation Mirror	• Reflects the laser light/K, the condensing angle of which has been corrected by the G1 Lens, onto the G2 Lens/K. • Reflects the laser light/K (for SOS), the condensing angle of which has been corrected by the G1 Lens, onto the SOS Lens.
[5]	Return Mirror/1st	• Reflects the laser light/Y, M, C condensed by the G1 Lens onto the G2 Lens/Y, M, C.
[6]	Synthetic Mirror/Y, M, C, K	• Reflects the laser light emitted by the semiconductor laser of each color onto the Polygon Mirror.
[7]	Semiconductor laser/Y, M, C, K	• Emits a laser light of each color.
[8]	Polygon Mirror	• Lets the incident laser light scan in the main scan direction and then strike the Separation Mirror.
[9]	G1 Lens	• Corrects the condensing angle of the incident laser light.
[10]	Return Mirror/2nd	• Reflects the laser light condensed by the G2 Lens onto the surface of the Photo Conductor/Y, M, C.

2.2 Operation

2.2.1 Overview

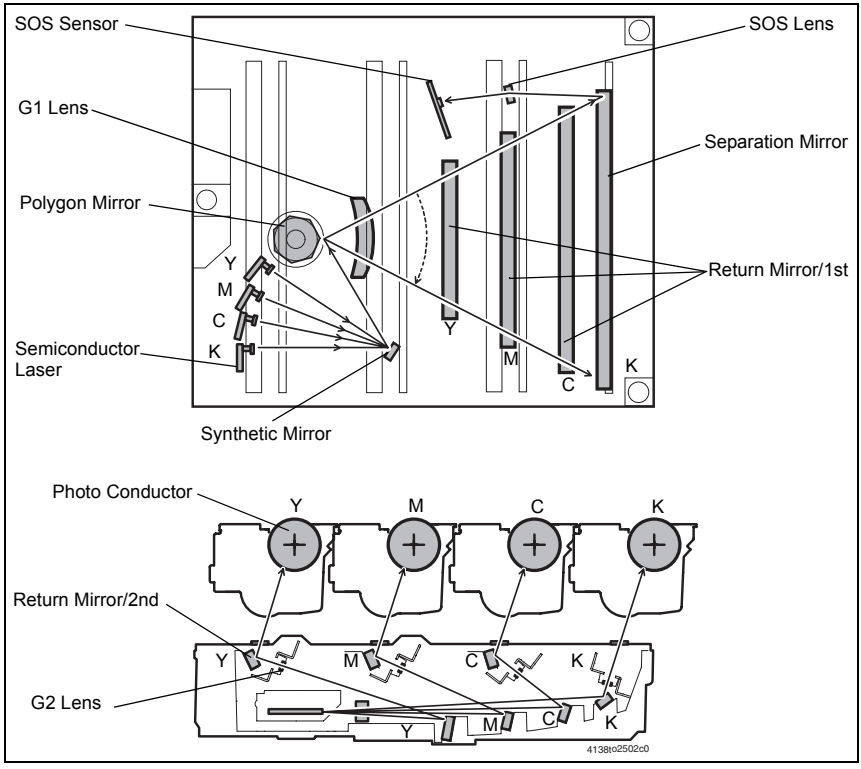
- Four semiconductor lasers provided, one for each of the four different colors. A single Polygon Motor is used to make a scan motion.
- Each Photo Conductor is irradiated with a laser light so that an electrostatic latent image is formed on it.

NOTE

- **The magicolor 5430 DL/5440 DL uses a different PH unit than does the magicolor 5450. When replacing the PH unit, be sure to use the PH unit for the appropriate model. Using the incorrect PH unit will adversely affect image quality.**

2.2.2 Laser exposure process

1. The laser light emitted by each of the Semiconductor Laser/Y, M, C, and K is reflected onto the Polygon Mirror via the Synthetic Mirror.
2. Since the angle of incidence for each color of laser light varies, the laser light reflected by the Polygon Mirror is reflected at a different angle for each color.
3. The condensing angle of each color of laser light is corrected by the G1 Lens before reaching each Return Mirror.
4. The K laser light is condensed on the surface of the Photo Conductor through the Separation Mirror and G2 Lens.
5. The Y, M, or C laser light is condensed on the Photo Conductor through the Separation Mirror, G2 Lens, and Return Mirror.



2.2.3 Laser emission timing

- When a Ready signal is detected after the lapse of a given period of time after the print cycle has been started, a Laser ON signal is output from the Print Control Board (PWB-P).
- The Laser ON signal triggers the firing of each laser light, which illuminates the SOS Board via the Polygon Mirror, G1 Lens, Separation Mirror (K), and SOS Lens. This generates an SOS signal.
- This SOS (Start of Scan) signal unifies the timing at which the laser lights are irradiated for each main scan line.
- The SOS signal is generated only from the K laser light. For the other colors, the emission timing is determined with reference to K.

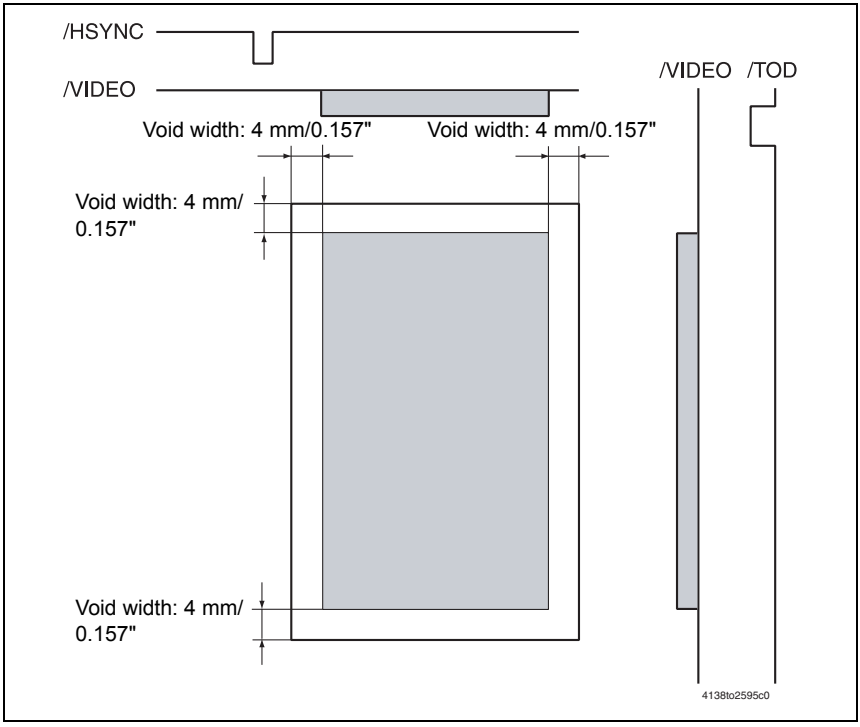
2.2.4 Laser emission area

A. Main scan direction (FD)

- The print start position in the FD direction is determined by the FD Print Start signal (HSYNC) that is output from the Print Control Board (PWB-P) and the width of the media.
- The laser emission area is determined by the media size.

B. Sub scan direction (CD)

- The print start position in the CD direction is determined by the CD Print Start signal (TOD) that is output from the Print Control Board (PWB-P) and the length of the media. However, there is a 4 mm/0.157" wide void area on both edges of the media.
- The laser emission area is determined by the media size. However, there is a 4 mm/0.157" wide void area on both the leading and trailing edges of the media.



2.2.5 Laser light intensity control

- The laser light intensity control corrects the target level of fluctuations in fine line reproduction and reverse image (white on black) reproduction that occur due to variations in photo conductor electrostatic characteristics, developing characteristics, and transfer characteristics (part-to-part variations, environment, durability).
- It is controlled integrally with other control items by the image stabilization control.
- The laser light intensity control is performed when there is a request made for execution of an image stabilization sequence.

☞ 2-120

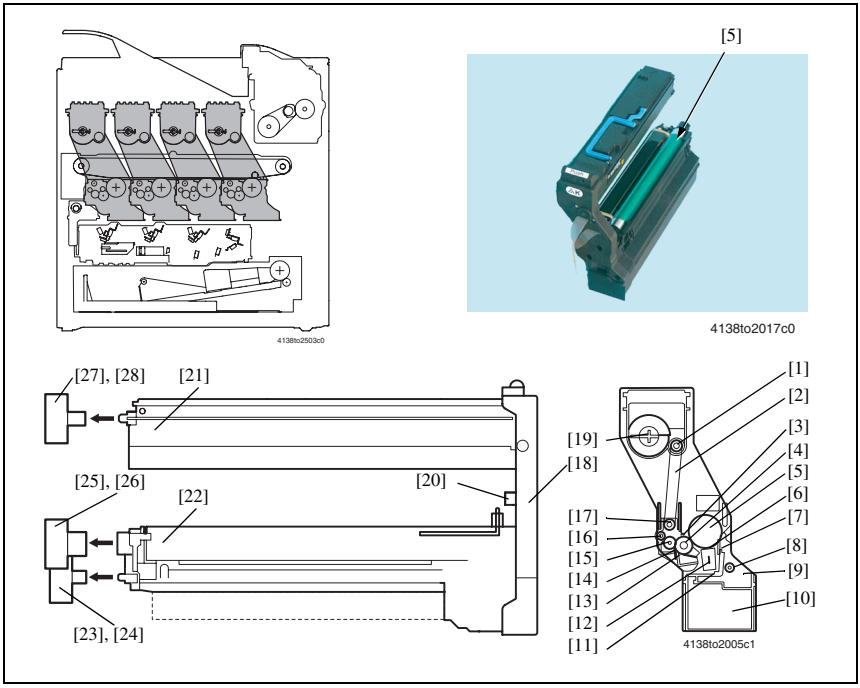
2.2.6 Registration correction control

- In a tandem engine that has an image forming process for each color of toner, incorrect color registration tends to occur due to variations in parts of the machine used for regulating the drawing positions. The registration correction control automatically detects and corrects this incorrect color registration.
- It is controlled integrally with other control items by the image stabilization control.
- The registration correction control is performed when there is a request made for execution of image stabilization sequence.

☞ 2-120

3. Toner Cartridge (TC) / TC Overall Composition

3.1 Composition

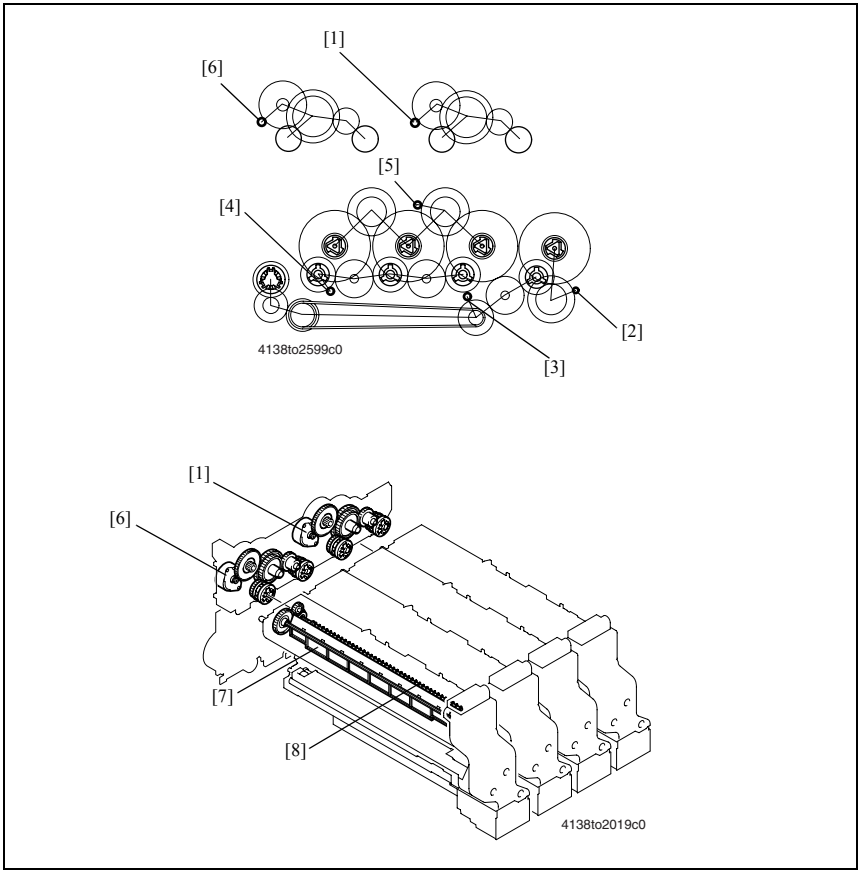


Key	Name	Function/system
[1]	Conveyance Screw	• Feeds toner in the Hopper to the Conveyance Pipe
[2]	Conveyance Pipe	• The pipe through which toner is conveyed from the Hopper to the Developing Unit
[3]	Charge Neutralizing Sheet	• Electrically removes toner off of the surface of the Developing Roller • The charge neutralizing bias voltage is applied to this sheet
[4]	Developing Roller	• Supplies toner fed by the Supply Roller to the surface of the Photo Conductor • Conveys toner to the surface of the Photo Conductor through potential difference • The developing bias voltage is applied to this roller • A given distance from the Photo Conductor is maintained by means of the Ds Roll • Single component developing system
[5]	Photo Conductor	• The drum surface on which an image of each color of toner is formed for subsequent transfer of the image to the Transfer Belt • OPC drum (ϕ30 mm)

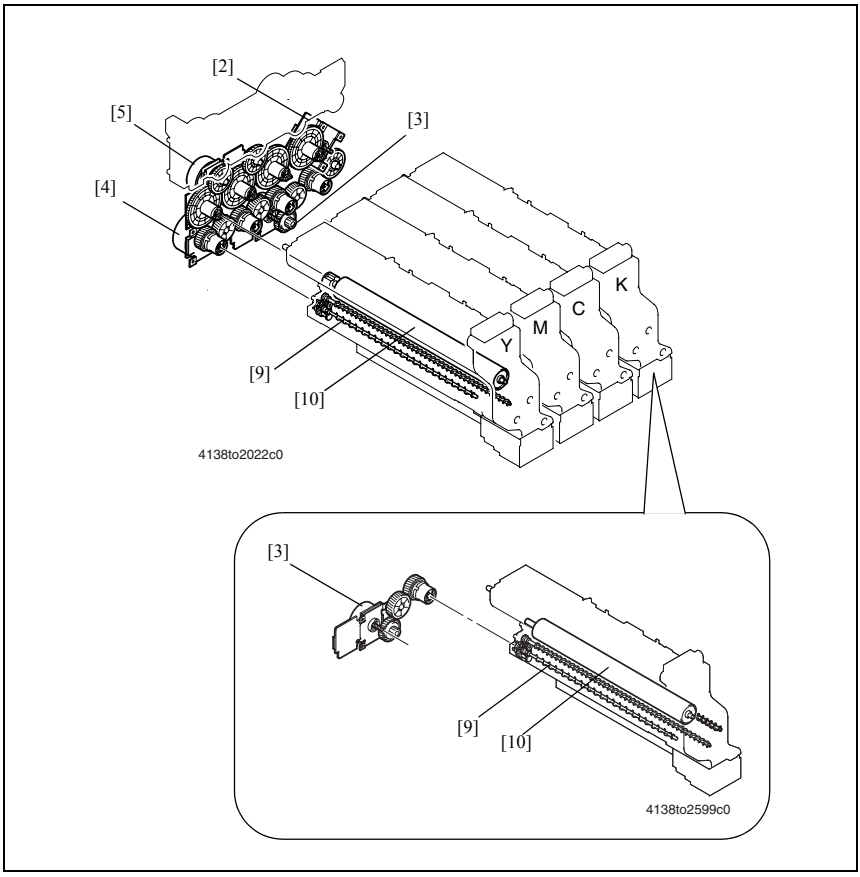
Key	Name	Function/system
[6]	Grid Mesh	• Evens out the charge deposited from the Electrode to make the surface potential uniform throughout the surface of the Photo Conductor • The grid voltage is applied to the Grid Mesh
[7]	Cleaning Blade	• Scrapes residual toner off the surface of the Photo Conductor
[8]	Toner Collecting Screw	• Conveys the waste toner scraped off by the Cleaning Blade into the Waste Toner Storage Tank
[9]	Cleaning Unit	• Recovers waste toner from the surface of the Photo Conductor and stores it
[10]	Waste Toner Storage Tank	• Stores waste toner of each color • Fixed type; requires no service jobs, including disposition of the stored waste toner • The storage tanks for Y, M, and C are of the same shape, while that for K is larger than the others to accommodate a greater amount of waste toner
[11]	Charge Corona	• Deposits a charge to the surface of the Photo Conductor • DC comb electrode Scorotron system
[12]	Electrode	• DC comb electrode Scorotron system • Maintenance free; no cleaning mechanism is available
[13]	Regulator Blade/1st, 2nd	• Regulates the height of toner on the surface of the Developing Roller • The blade bias voltage is applied to the blade
[14]	Toner Chamber	• Tank in which toner fed off from the Hopper is temporarily stored
[15]	Supply Roller	• Supplies toner in the Toner Chamber to the Developing Roller • Conductive elastic roller • Conveys toner to the surface of the Developing Roller through potential difference • The supply bias voltage is applied to this roller
[16]	Agitating Screw	• Agitates toner fed off by the Replenishing Screw with that in the Toner Chamber so that it is charged • Two-shaft agitating system
[17]	Replenishing Screw	• Feeds toner through the Conveyance Pipe to the Toner Chamber • Mixes toner in the Toner Chamber so that it is charged • Two-shaft agitating system
[18]	Connection	• Conveys toner from the Hopper to the Developing Unit
[19]	Agitating Blade	• Agitates toner in the Hopper
[20]	TC Detection Board (CSIC)	• Detects a TC installed in the machine; it detects not only a new TC, but also a half-used one • Stores information on each individual TC (period of time of use, etc.)

Key	Name	Function/system
[21]	Hopper	• Loaded with toner that is conveyed onto the Developing Unit by way of the Conveyance Pipe • Capacity Toner Cartridge shipped with machine: Quantity equivalent to 3000 printed pages Standard Toner Cartridge: Quantity equivalent to 6000 printed pages High-Capacity Toner Cartridge (magicolor 5440 DL/5450 only): Quantity equivalent to 12,000 printed pages • Single-component SMT toner
[22]	Developing Unit	• Applies a uniform coat of toner fed from the Hopper to the surface of the Photo Conductor
[23]	Developing Motor/Y, M, C (M1)	• Drives the rollers and screws of the Y, M, or C Developing Unit • De-energized in the monochrome mode • Brushless DC motor
[24]	Developing Motor/K (M5)	• Drives the rollers and screws of the K Developing Unit • Provides drive also for the Waste Toner Box • Brushless DC motor
[25]	Color PC Drum Motor (M2)	• Drives the Y, M, and C Photo Conductors • De-energized in the monochrome mode • Brushless DC motor
[26]	Intermediate Transport Motor (M3)	• Drives the K Photo Conductor • Provides drive also for the conveyance section, 2nd transfer section, media feed section, and other parts
[27]	Toner Supply Motor/Y, M (M6)	• Drives the Agitating Blades and Conveyance Screws of the Y, M, C, and K Hoppers • Stepping motor
[28]	Toner Supply Motor/C, K (M7)	

3.2 Drive



[1] Toner Supply Motor/C, K (M7)
[2] Intermediate Transport Motor (M3)
[3] Developing Motor/K (M5)
[4] Developing Motor/Y, M, C (M1)
[5] Color PC Drum Motor (M2)
[6] Toner Supply Motor/Y, M (M6)
[7] Agitating Blade
[8] Conveyance Screw



[1] Toner Supply Motor/C, K (M7)

[2] Intermediate Transport Motor (M3)

[3] Developing Motor/K (M5)

[4] Developing Motor/Y, M, C (M1)

[5] Color PC Drum Motor (M2)

[6] Toner Supply Motor/Y, M (M6)

[7] Agitating Blade

[8] Conveyance Screw

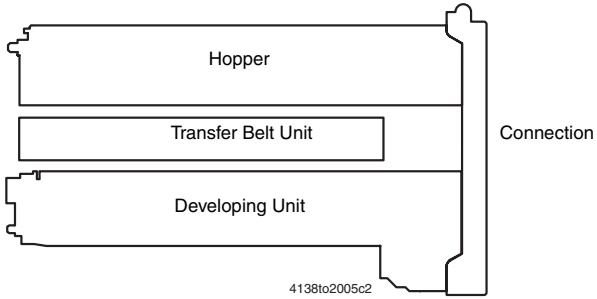
[9] Agitating Screw, Replenishing Screw, Supply Roller, Developing Roller, Toner Collecting Screw

[10] Photo Conductor

3.3 Operation

3.3.1 Configuration of Toner Cartridge

- The Toner Cartridge is U-shaped, positioned so as to enclose the Transfer Belt Unit. It consists of three major sections: the Hopper, Developing Unit, and Connection.



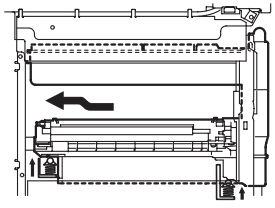
3.3.2 Loading/unloading mechanism of Toner Cartridge

A. Loading procedure

- Hold the handle on the upper part of the Toner Cartridge with your left hand and support the front face of the cartridge with your right hand.
- Position the Hopper in alignment with the rail on the machine side and insert the cartridge into the machine.
- When the upper handle contacts the machine frame, place it down and push the front side of the cartridge with your right hand.

B. Pressure mechanism

- To avoid a contact between the Transfer Belt and Toner Cartridge, the Toner Cartridge is inserted along the rail from a lowered position. The rail raises the cartridge as the cartridge reaches the rear end of the machine.
- At the same time that the cartridge is loaded in the machine, it is pressed into the predetermined position (upward) by springs in the order of its rear end and its front end.
- The pressure mechanisms provided at the front and rear ends ensure that the entire pressure is not applied to the cartridge all at once.
- After the cartridge has been pressed upward, a lock pawl is engaged. The cartridge is thus clicked in position to let the user know that it is properly loaded in position.

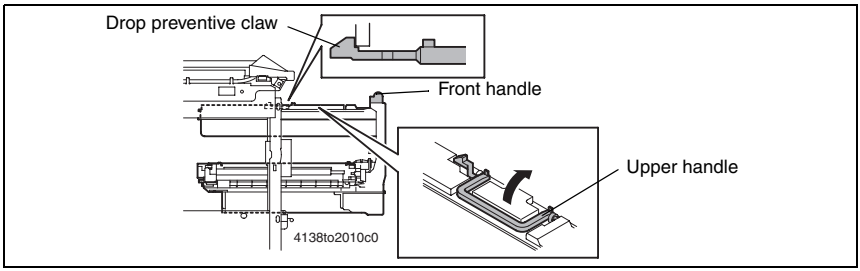


C. Drop preventive mechanism

- To prevent the Toner Cartridge from being dropped as it is unloaded, there is a drop preventive claw provided at the upper handle.
- Unless the upper handle is placed up, the cartridge is stopped halfway, which prevents the cartridge from being slid out further.

D. Removal procedure

- The Toner Cartridge is pressed in the predetermined position. Pushing down the front handle once will disengage the lock pawl.
- Hold the front handle with your right hand and withdraw the Hopper.
- When the drop preventive claw of the upper handle is about to hit against the machine frame, raise the upper handle. This retracts the drop preventive claw.
- Holding onto the upper handle with your left hand, slide out the Toner Cartridge.



3.3.3 Toner Cartridge life control

- The Toner Cartridge life is determined based on toner empty condition detection and the period of time through which the Photo Conductor has been turned.
- Each Toner Cartridge is provided with a TC Detection Board (CSIC) that detects a new TC, a toner near-empty condition, and a toner empty condition.

A. Cartridge detection and new cartridge detection timing

- The machine attempts to perform a detection sequence when the Front Door is closed.

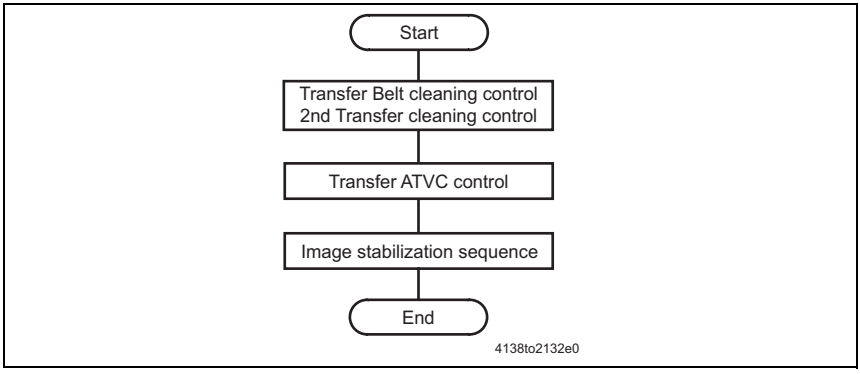
B. Cartridge detection

- The machine accesses the TC Detection Board (CSIC) to check for data stored in it. Using that data, the machine determines whether or not a cartridge is loaded.

C. New cartridge detection

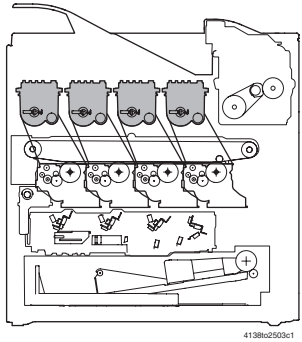
- After a cartridge has been detected, the machine determines whether it is new or not based on the data acquired.

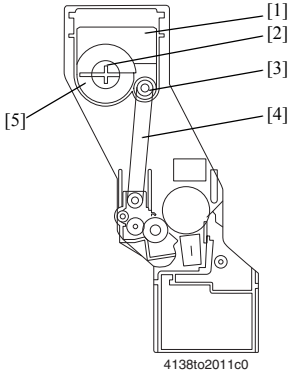
D. Operation after new cartridge detection



4. Toner Cartridge / Hopper

4.1 Composition





Key	Name	Function/system
[1]	Hopper	• Loaded with toner that is conveyed onto the Developing Unit by way of the Conveyance Pipe • Capacity: Toner Cartridge shipped with machine: Quantity equivalent to 3,000 printed pages Standard Toner Cartridge: Quantity equivalent to 6,000 printed pages High-Capacity Toner Cartridge (magicolor 5440 DL/5450 only): Quantity equivalent to 12,000 printed pages • Single-component SMT toner
[2]	Agitating Blade	• Agitates toner in the Hopper
[3]	Conveyance Screw	• Feeds toner in the Hopper off to the Conveyance Pipe
[4]	Conveyance Pipe	• The pipe through which toner is conveyed from the Hopper to the Developing Unit
[5]	Toner Supply Motor/Y, M (M6)	• A single motor is turned either forward or backward to drive the Agitating Blades and Conveyance Screws of the Y or M Hopper to accomplish supply of toner • Stepping motor
	Toner Supply Motor/C, K (M7)	• A single motor is turned either forward or backward to drive the Agitating Blades and Conveyance Screws of the C or K Hopper to accomplish supply of toner • Stepping motor

4.2 Operation

4.2.1 Toner Level Detection (magicolor 5430 DL/5440 DL)

- The toner level is determined by the accumulated time of rotation of the toner supply motor and the PC Drum.
- The toner levels of the magicolor 5430 DL/5440 DL can be checked through the “MENU/SPECIAL PAGES/PRINT CONFIG PAGE” or “MENU/CONSUMABLE USAGE” configuration menu.

NOTE

- **When the toner remaining in the cartridge is between 88% and 100%, the display shows “100%,” regardless of the actual amount. The amount of toner supplied to the toner cartridge may vary slightly. Also, some toner is consumed when checking the screen during manufacture.**
- **When the amount of toner is 87% or less, the display shows the exact amount of toner.**

4.2.2 Toner Level Detection (magicolor 5450)

- The toner level is determined by the accumulated time of rotation of the toner supply motor and the PC Drum.
- The toner levels of the magicolor 5450 can be checked through the “PRINT MENU/STATISTICS PAGE” configuration menu.

NOTE

- **When the toner remaining in the cartridge is between 95% and 100%, the display shows “100%,” regardless of the actual amount. The amount of toner supplied to the toner cartridge may vary slightly. Also, some toner is consumed when checking the screen during manufacture.**
- **When the amount of toner is 94% or less, the display shows the exact amount of toner.**

4.2.3 Toner near-empty condition detection

- The cumulative period of time through which the Toner Supply Motor is energized is detected as the basis for determining whether there is a toner near-empty condition.
- When a new Toner Cartridge is detected, the cumulative energization time counter is reset to let it start counting the time anew.

- <Near-empty decision>

1. The machine determines whether there is a toner near-empty condition when the cumulative energization time counter of the Toner Supply Motor exceeds a predetermined value.

- <Resetting near-empty condition>

1. A toner near-empty condition is reset when a new Toner Cartridge is detected.

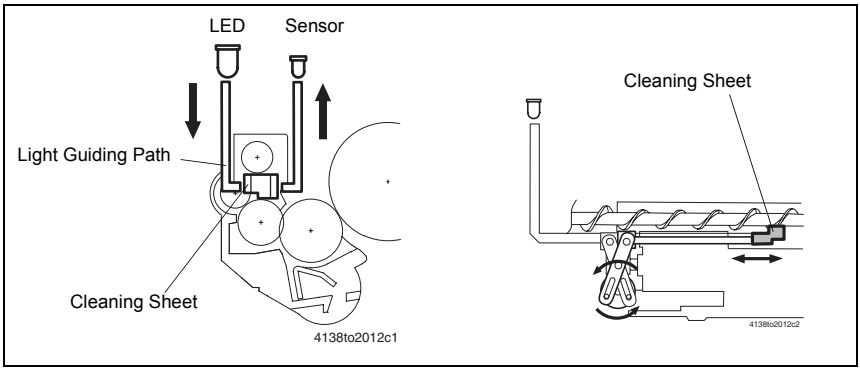
- About 500 to 1500 printed pages can be produced during the period of time that begins when a near-empty condition is detected and ends when an empty condition is detected (for a standard original of a 5% coverage rate and using a standard Toner Cartridge).
- A warning message is displayed when a near-empty condition is detected.

- <Toner near-empty messages>
 The relevant warning message is displayed when a toner near-empty condition is detected.

magicolor 5430 DL / 5440 DL	magicolor 5450
C TONER LOW	TONER LOW Y
M TONER LOW	TONER LOW M
Y TONER LOW	TONER LOW C
K TONER LOW	TONER LOW K

4.2.4 Toner empty condition detection

- A toner empty condition is detected by the LED and toner level sensor mounted on the Toner Level Sensor Board (PWB-D) provided in the machine.
- Light emitted from the LED travels through the light guiding path and is guided into the Toner Cartridge.
- The toner level sensor detects the intensity of the transmitted light guided through the light guiding path from the inside of the Toner Cartridge. The toner level is thereby estimated.
- To ensure correct detection of the intensity of transmitted light by the toner level sensor, a cleaning sheet is provided that cleans the window in the light guiding path periodically.



- Detection start timing

1. When the Developing Unit is driven evenly
2. LED steady light is stabilized
3. When the above two conditions are met, the machine starts a toner empty detection sequence. Detection control is, however, interrupted during registration correction and gamma correction, in which it is not possible to acquire output values of the toner level sensor.

- <Empty decision>

1. A sequence is started for detecting a toner empty condition when a toner near-empty condition is detected.
2. The machine determines that there is a toner empty condition when the toner level sensor output value remains below a predetermined value and if the following event is detected a predetermined number of consecutive times: the output value of the toner level sensor remains a predetermined value or lower for more than a predetermined period of time.
3. The consecutive detection count is retained even when power is turned OFF.

- <Resetting empty condition>
 A toner empty condition is reset when a new Toner Cartridge is detected.

- <Toner empty messages>
 The relevant warning message is displayed when a toner empty condition is detected.

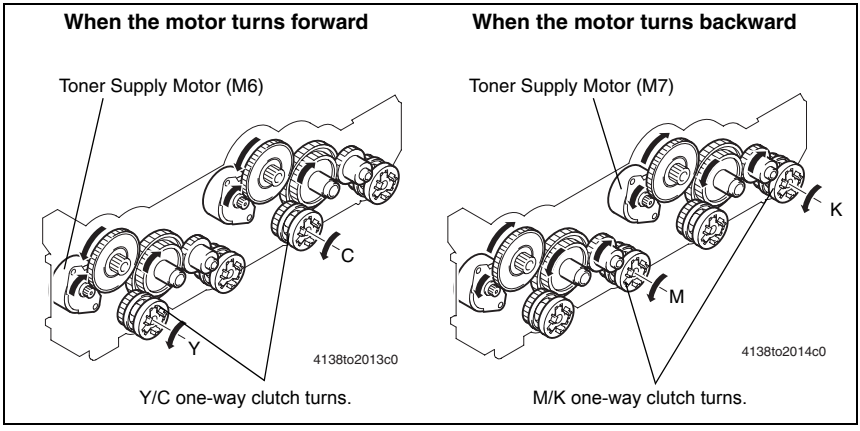
magicolor 5430 DL/5440 DL	magicolor 5450
REPLACE TONER CYAN	TONER EMPTY REPLACE Y
REPLACE TONER MAGENTA	TONER EMPTY REPLACE M
REPLACE TONER YELLOW	TONER EMPTY REPLACE C
REPLACE TONER BLACK	TONER EMPTY REPLACE K

4.2.5 Toner replenishing mechanism/control

A. Toner replenishing mechanism

- The Toner Supply Motor is energized according to the condition of the toner level sensor for each color of toner. Toner is then supplied from the Hopper to the Developing Unit as necessary.
- A single Toner Supply Motor is turned either forward or backward to accomplish supply of toner of two different colors (one motor is for Y and M, and the other for C and K). That is, M (K) toner cannot be supplied while Y (C) toner is being supplied.
- Toner is supplied only while the Developing Unit is being driven. This is because of the following reason: if toner is supplied from the Hopper while the Developing Unit remains stationary, toner stagnates at the Developing Unit.

Toner Supply Motor	Direction of rotation (as viewed from above of motor shaft)	Toner supply (Agitating Blade/Conveyance Screw)			
		Y	M	C	K
/Y, /M (M6)	Forward (clockwise)	Turned	Stationary	Stationary	Stationary
	Backward (counterclockwise)	Stationary	Turned	Stationary	Stationary
/C, /K (M7)	Forward (clockwise)	Stationary	Stationary	Turned	Stationary
	Backward (counterclockwise)	Stationary	Stationary	Stationary	Turned



B. Toner replenishing decision control

- Toner replenishing decision control is provided only while the Developing Unit is driven evenly.
- The machine determines that toner replenishing for the Developing Unit is necessary when the toner level sensor output value remains below a predetermined value and if the following event is detected a predetermined number of consecutive times: the output value of the toner level sensor remains a predetermined value or lower for more than a predetermined period of time.
- The toner replenishing decision control is interrupted during registration correction and gamma correction, in which it is not possible to acquire output values of the toner level sensor.

C. Toner Supply Motor control

- The Toner Supply Motor control is carried out when all of the following conditions are met while the Developing Motor turns evenly.

1. The toner level sensor output value indicates that toner replenishing for the Developing Unit is required.
2. The Toner Supply Motor has not been energized for a predetermined period of time or more after the condition, in which the Developing Unit needs toner to be replenished, has been established.
3. A predetermined period of time elapses after the Toner Supply Motor has been energized for a predetermined period of time or more after the condition, in which the Developing Unit needs toner to be replenished, was established.

D. Toner Supply Motor control start timing (1)

- The Toner Supply Motor starts turning when all of the following conditions are met:

1. The Developing Motor turns evenly.
2. The toner level sensor output value indicates that toner replenishing for the Developing Unit is required.
3. A predetermined period of time elapses after the Toner Supply Motor has been energized for a predetermined period of time or more after the condition, in which the Developing Unit needs toner to be replenished, was established.

E. Toner Supply Motor control start timing (2)

- The Toner Supply Motor starts turning when all of the following conditions are met:

1. The Developing Motor turns evenly.
2. The Toner Supply Motor has not turned for a predetermined period of time during the last toner replenishing sequence.

F. Toner Supply Motor starting timing control

- Since a single Toner Supply Motor is turned forward or backward to replenish the supply of either one of two colors of toner, M (K) toner cannot be supplied while Y (C) toner is being supplied.
- Control is provided to assign a uniform replenishing timing, thereby ensuring that the four colors of toner are supplied evenly.

1. A replenishing sequence is started when it becomes necessary to replenish the supply of Y/C toner (M/K toner).
2. The supply of Y/C toner is replenished for a predetermined period of time. If there is a request for replenishing the supply of M/K toner thereafter, a replenishing sequence is started again.
 Note, however, that the new replenishing sequence can be started only after the lapse of a predetermined period of time after the supply of Y/C toner (M/K toner) has been replenished. If another request is made for replenishing the supply of Y/C toner (M/K toner) after the lapse of this predetermined period of time, and if there is no request for replenishing the supply of M/K toner (Y/C toner), the supply of Y/C toner (M/K toner) is replenished again.
3. If the other Toner Supply Motor is being started when a toner replenishing sequence using one Toner Supply Motor is to be started, this replenishing sequence is not started. The sequence is started only after rotation of the other Toner Supply Motor has become stable.

G. Toner Supply Motor control termination timing

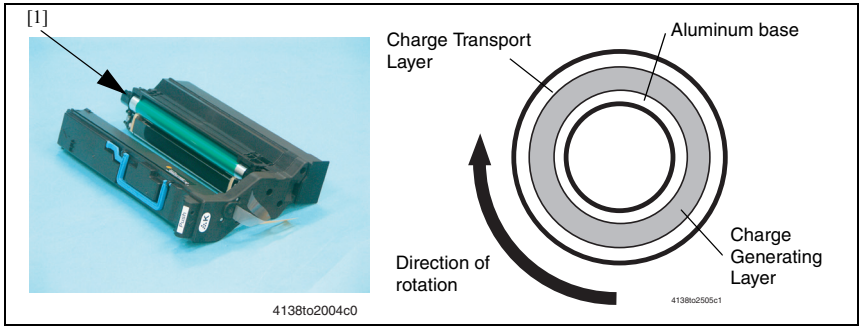
- The Toner Supply Motor is brought to a stop or interrupted under any of the following conditions:

1. The Developing Motor stops completely or turns unevenly.
2. The Toner Supply Motor has turned for a predetermined period of time.
3. Toner Supply Motor rotation prohibition timing

- If a toner replenishing sequence is interrupted, the Toner Supply Motor turns for the remaining period of time to replenish the supply of toner when the Developing Motor is energized next time.

5. Toner Cartridge / Photo Conductor

5.1 Composition

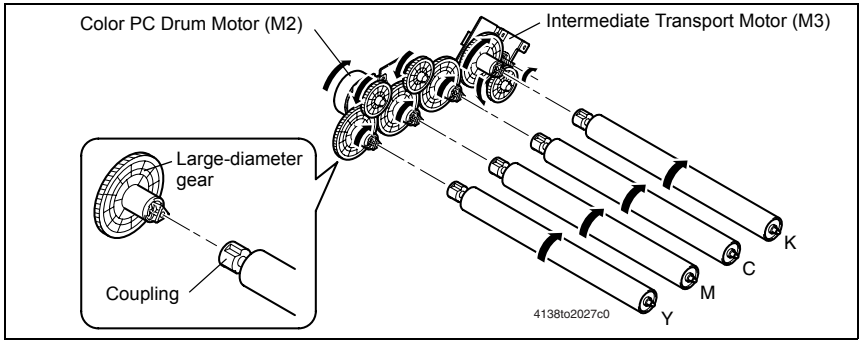


Key	Name	Function/system
[1]	Photo Conductor/Y, M, C, K	• Drum surface on which an image of each color of toner is formed for subsequent transfer of the image to the Transfer Belt. • OPC drum (ϕ30 mm)

5.2 Operation

5.2.1 Photo Conductor drive mechanism

- Motors are used for the drive mechanism independently of the developing system to suppress incorrect color registration and uneven pitch.
- To stop the drive for the color Toner Cartridges in the monochrome mode, different motors are used to drive the color Photo Conductors and black Photo Conductor.
- The Color PC Drum Motor (M2) drives the Photo Conductor/Y, M, and C, while the Intermediate Transport Motor (M3) drives the Photo Conductor/K.
- In addition to the Photo Conductor/K, the Intermediate Transport Motor (M3) also drives the transfer system, paper feed system, and synchronizing drive system.
- Gears having a large diameter are used to enhance rotating accuracy of the Photo Conductors.
- The use of gears having a large diameter provides a large number of gear teeth, which suppresses uneven pitch and eccentricity.
- Drive is transmitted to each of the Photo Conductors when the coupling on the drive end is engaged with that on the driven end.



5.2.2 Photo Conductor post-exposure control

- The entire surface of the Photo Conductor is exposed to light before the Photo Conductor stops rotating during the stop sequence or color change sequence (from the color print to monochrome print) after a print cycle.
- Ozone stagnant in areas near the Charge Corona Unit is adsorbed on the surface of the Photo Conductor. This reduces sensitivity of the Photo Conductor, causing white bands to occur in the image.
- To prevent this image failure from occurring, the entire surface of the Photo Conductor is exposed to light and thus neutralized. This effectively prevents the surface of the Photo Conductor from absorbing ozone.

- <Execution timing>

1. The total exposure sequence is started after the last image moves past the exposure position (to prevent dirt on the background due to a potential difference between the Photo Conductor and the Developing Unit).

5.2.3 Photo Conductor total exposure control upon recovery

- If the “Photo Conductor post-exposure control” described above is not correctly done, the entire surface of the Photo Conductor is exposed to light, thereby preventing ozone from being adsorbed on the surface of the Photo Conductor.
- If the “Photo Conductor post-exposure control” is not performed due to a media misfeed or malfunction, the entire surface of the Photo Conductor is exposed to light at the same time that the “2nd Transfer Roller cleaning control” is performed during the recovery procedure from the media misfeed or malfunction.

☞ 2-53

- <Execution timing>

1. If a media misfeed or malfunction was present when the Power Switch was turned OFF last time, the “Photo Conductor total exposure control upon recovery” sequence is performed at the same time with the 2nd Transfer Roller cleaning control when the Power Switch is next turned ON.

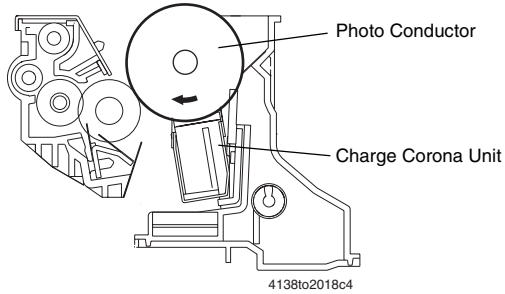
2. The control is executed during the recovery procedure from a media misfeed or malfunction.

5.2.4 Photo Conductor small amount rotation control

- Ozone stagnant in areas near the Charge Corona Unit reduces sensitivity of the Photo Conductors, causing white bands to occur in the image.
- To prevent this image problem, the Photo Conductor is turned so as to allow its surface facing the Charge Corona Unit to deviate, thereby preventing the surface sensitivity from being reduced.

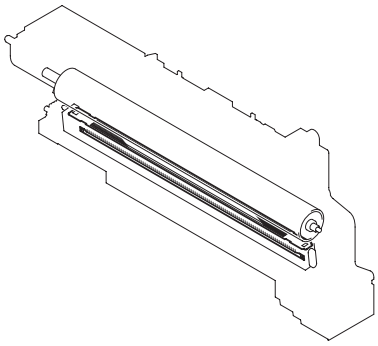
A. Photo Conductor small amount rotation timing

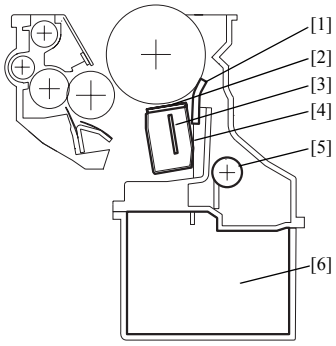
- The number of execution sequences is determined when the post process following a print cycle is completed. The control is executed while the Color PC Drum Motor (M2) or Intermediate Transport Motor (M3) is in the standby state.
- If the color Photo Conductors need to be turned a small amount during the monochrome mode, the control is executed also for the color Photo Conductors.



6. Toner Cartridge / Charge Corona Section

6.1 Composition

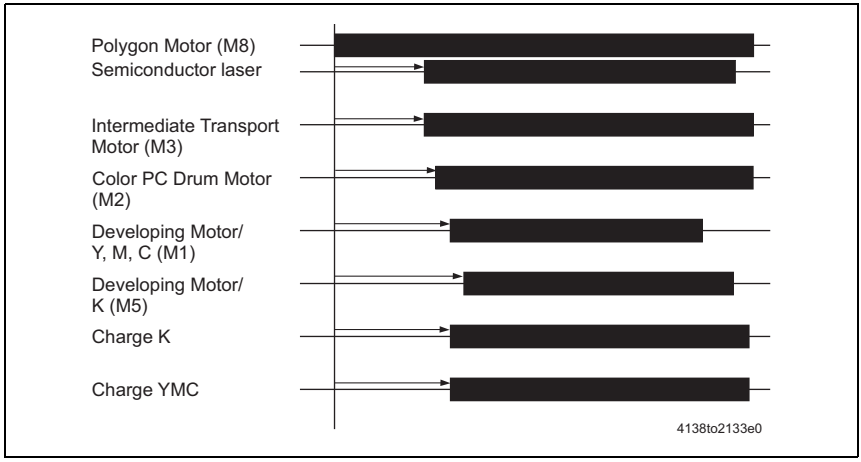




Key	Name	Function/system
[1]	Cleaning Blade	• Scrapes residual toner off the surface of the Photo Conductor
[2]	Grid Mesh	• Evens out the charge deposited from the Electrode to make the surface potential uniform throughout the surface of the Photo Conductor • The grid voltage is applied to the Grid Mesh
[3]	Electrode	• DC comb electrode Scorotron system • Using the comb electrode ensures that the charge is concentrated on the grid mesh, thus reducing the amount of ozone produced • The charge corona voltage is applied • Maintenance free; no cleaning mechanism is available
[4]	Charge Corona	• Deposits a charge to the surface of the Photo Conductor • DC comb electrode Scorotron system
[5]	Toner Collecting Screw	• Conveys the waste toner scraped off by the Cleaning Blade into the Waste Toner Storage Tank • Screw type
[6]	Waste Toner Storage Tank	• Stores waste toner of each color • Fixed type; requires no service jobs, including disposition of the stored waste toner • The storage tanks for Y, M, and C are of the same shape, while that for K is larger than others to accommodate a greater amount of waste toner

6.2 Operation

6.2.1 Charge Corona Unit ON/OFF control



6.2.2 Output during pre-process

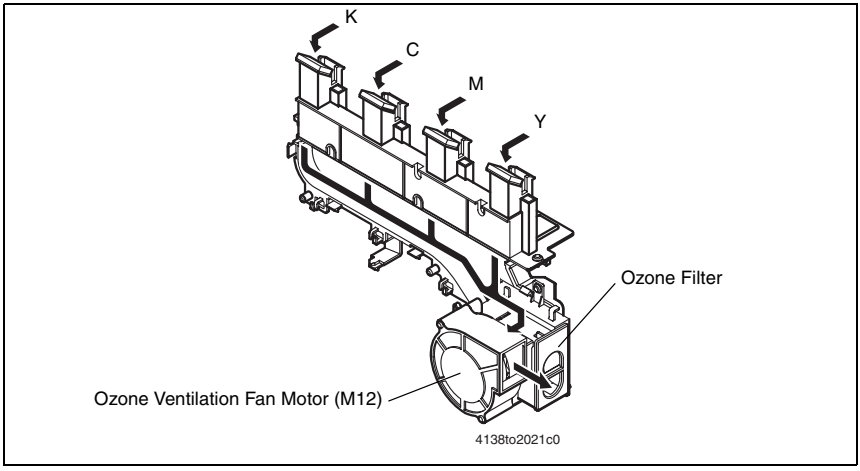
- Color mode: The charge corona voltage for all colors of toner is applied after rotation of the Color PC Drum Motor (M2) has stabilized.
- Monochrome mode: The charge corona voltage for K is applied after rotation of the Intermediate Transport Motor (M3) has stabilized.
- Image formation is possible for the area, to which the charge corona voltage is applied.

6.2.3 Output during post-process

- The output of the charge corona voltage is shut down when the entire exposed area of the Photo Conductor moves past the charge corona section after the 1st transfer process has been completed.

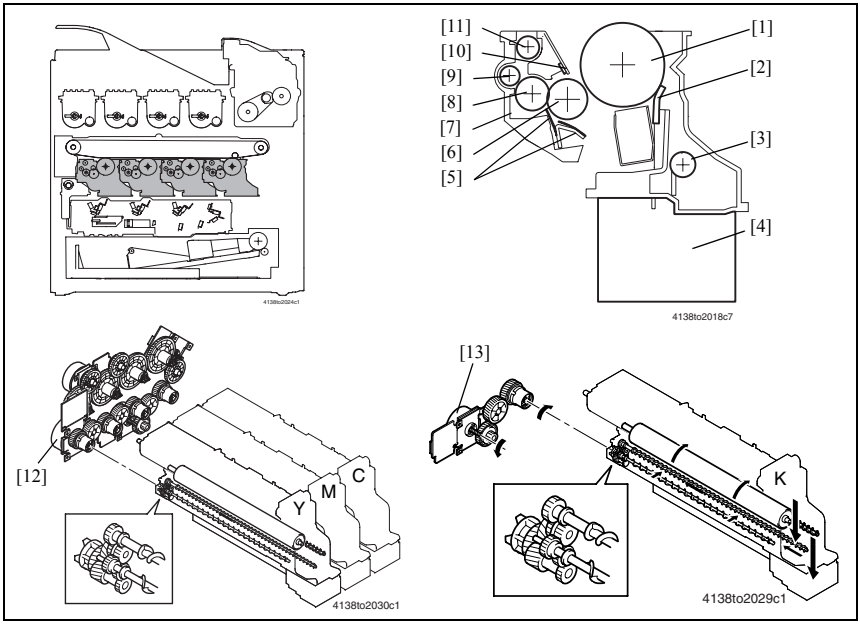
6.2.4 Ozone ventilation mechanism

- Ozone stagnant in areas near the Charge Corona Unit reduces sensitivity of the Photo Conductor, causing white bands to occur in the image.
- The Ozone Filter is used to remove ozone produced by the Charge Corona Unit, thereby preventing sensitivity of the Photo Conductor surface from being degraded.
- The urethane rubber affixed to the side face of the Charge Corona Unit is brought into contact the Photo Conductor, which makes the Charge Corona Unit in tight contact with the Photo Conductor.
- Outside air is drawn in through the opening provided at the front end of the Charge Corona Unit and is discharged together with ozone through the opening provided in the rear.
- The Ozone Ventilation Fan Motor (M12) located in the rear of the machine draws air to allow the discharged ozone to be removed by the Ozone Filter.
- The Ozone Ventilation Fan Motor (M12) is kept energized for 3 min. after the print cycle has been completed.
- The Ozone Ventilation Fan Motor (M12) also functions to cool down the Print Head.



7. Toner Cartridge / Developing Unit

7.1 Composition

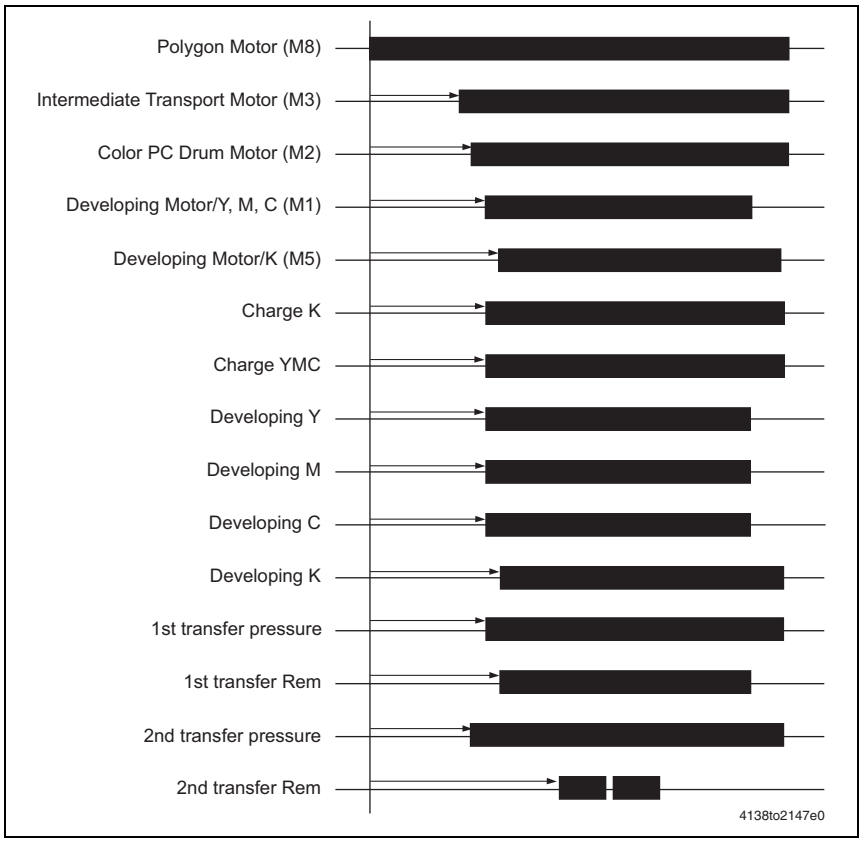


Key	Name	Function/system
[1]	Photo Conductor/Y, M, C, K	• The drum surface on which an image of each color of toner is formed for subsequent transfer of the image to the Transfer Belt • OPC drum (ϕ30 mm)
[2]	Cleaning Blade	• Scrapes residual toner off the surface of the Photo Conductor
[3]	Toner Collecting Screw	• Conveys the waste toner scraped off by the Cleaning Blade into the Waste Toner Storage Tank
[4]	Waste Toner Storage Tank	• Stores waste toner of each color • Fixed type; requires no service jobs, including disposition of the stored waste toner • The storage tanks for Y, M, and C are of the same shape, while that for K is larger than others to accommodate a greater amount of waste toner
[5]	Regulator Blade/1st, 2nd	• Regulates the height of toner on the surface of the Developing Roller • The blade bias voltage is applied to the blade

Key	Name	Function/system
[6]	Developing Roller	• Supplies toner fed by the Supply Roller to the surface of the Photo Conductor • Conveys toner to the surface of the Photo Conductor through potential difference • The developing bias voltage is applied to this roller • A given distance from the Photo Conductor is maintained by means of the Ds Roll • Single component developing system
[7]	Toner Chamber	• Tank in which toner fed off from the Hopper is temporarily stored
[8]	Supply Roller	• Supplies toner in the Toner Chamber to the Developing Roller • Conductive elastic roller • Conveys toner to the surface of the Developing Roller through potential difference • The supply bias voltage is applied to this roller
[9]	Agitating Screw	• Agitates toner fed off by the Replenishing Screw with that in the Toner Chamber so that it is charged • Two-shaft agitating system
[10]	Charge Neutralizing Sheet	• Electrically removes toner off the surface of the Developing Roller • The charge neutralizing bias voltage is applied to this sheet
[11]	Replenishing Screw	• Feeds toner fed through the Conveyance Pipe to the Toner Chamber • Agitates toner in the Toner Chamber • Two-shaft agitating system
[12]	Developing Motor/Y, M, C (M1)	• Drives the rollers and screws of the Y, M, or C Developing Unit • De-energized in the monochrome mode • Brushless DC motor
[13]	Developing Motor/K (M5)	• Drives the rollers and screws of the K Developing Unit • Provides drive also for the Waste Toner Box ☞ 2-57 • Brushless DC motor

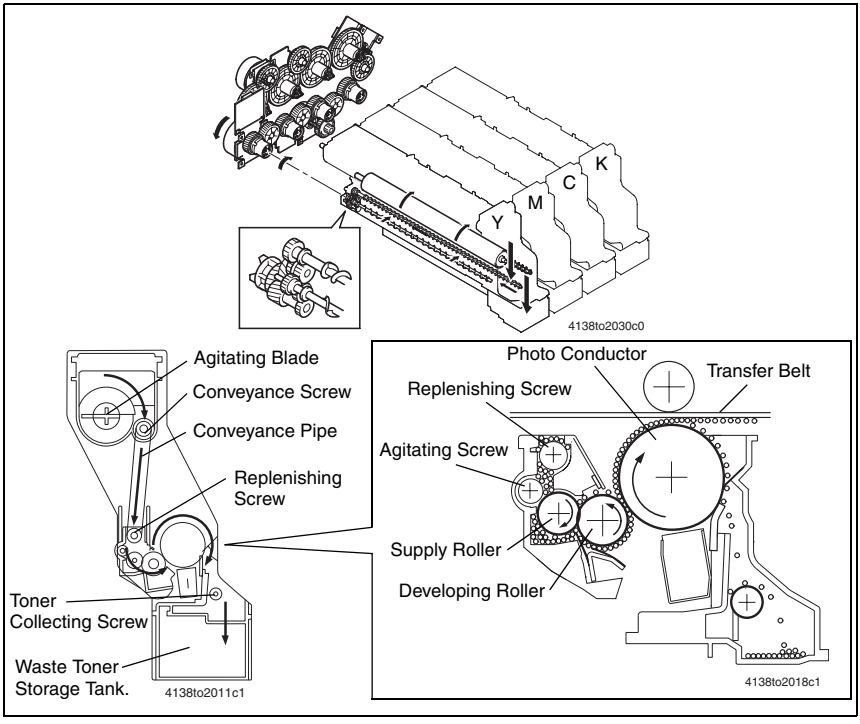
7.2 Operation

7.2.1 Developing drive control



7.2.2 Toner flow

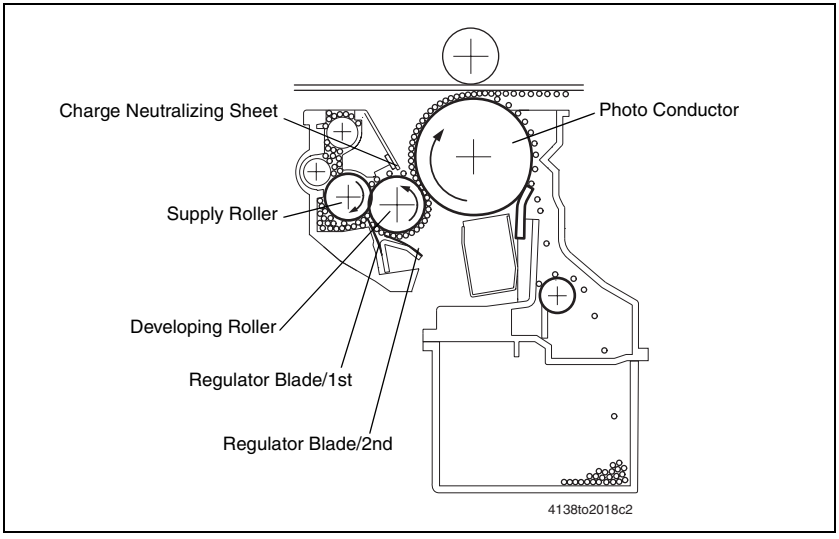
1. Toner stored in the Hopper is agitated by the Agitating Blade and conveyed onto the front side of the Hopper by the Conveyance Screw.
2. The toner conveyed onto the front side of the Hopper is conveyed down to the Toner Chamber through the Conveyance Pipe.
3. The toner conveyed from the Hopper is conveyed onto the Toner Chamber by the Replenishing Screw.
4. The toner level detection system provided on the front side of the Developing Unit (the sensor is mounted on the machine side) detects, at this time, the level of toner still available for use in the Toner Chamber.
5. The toner conveyed to the Toner Chamber is agitated (charged) by the Replenishing Screw and Agitating Screw.
6. Toner conveyed onto the rear side of the Toner Chamber is fed to the Supply Roller.
7. Toner fed to the Supply Roller is conveyed onto the Developing Roller.
 At this time, the Regulator Blade/1st and /2nd regulate the height of toner on the surface of the Developing Roller.
8. Toner on the Developing Roller is fed to the electrostatic latent image formed on the surface of the Photo Conductor.
9. Toner left on the Developing Roller is neutralized and returned to the Supply Roller.
10. The toner on the surface of the Photo Conductor is transferred onto the Transfer Belt.
11. Toner left on the surface of the Photo Conductor is scraped off by the Cleaning Blade.
12. The toner scraped off by Cleaning Blade is conveyed to the Waste Toner Storage Tank by the Toner Collecting Screw.
13. The toner conveyed by the Toner Collecting Screw is stored as waste toner in the Waste Toner Storage Tank.



7.2.3 Developing system

- Two types of developing systems are used, a non-contact developing system and an alternating current application system.

1. A negative charge (supply bias voltage Vr) is applied the Supply Roller to regulate the amount of toner sticking to the Developing Roller.
2. A negative charge (blade bias voltage Vb1) is applied to the Regulator Blade/1st to negatively charge the toner and form a thin layer of toner.
3. Toner on the surface of the Developing Roller is evened out by the Regulator Blade/ 2nd.
4. During development, DC + AC developing bias voltage (Vb) is applied to Developing Roller. The AC component of the developing bias voltage is applied only during development. At any time other than the development, only the DC component of the developing bias voltage is applied.
5. Toner sticks to the Photo Conductor when the AC component of the developing bias voltage (Vpp) is negative. The time length of the negative component (Vpp) determines the image density.
6. A negative charge (charge neutralizing bias voltage: same potential as the developing bias) is applied to the Charge Neutralizing Sheet to neutralize any toner left on the surface of the Developing Roller. The neutralized toner is returned to the Supply Roller.



7.2.4 Developing bias Vpp control (Ds compensation control)

- If the developing bias voltage AC component (Vpp) is too high for the Ds distance in each Toner Cartridge, a leak image (background leak, image area leak) or halftone reproduction failure results.
- As a means for preventing this phenomenon, this control detects a Vpp range, in which no image failure occurs, to set the optimum Vpp.
- The Vpp control may be either the simplified check or complete correction.
- The developing bias Vpp is controlled integrally with other control items by the image stabilization control.
- The developing bias Vpp control is performed when there is a request made for execution of image stabilization sequence.

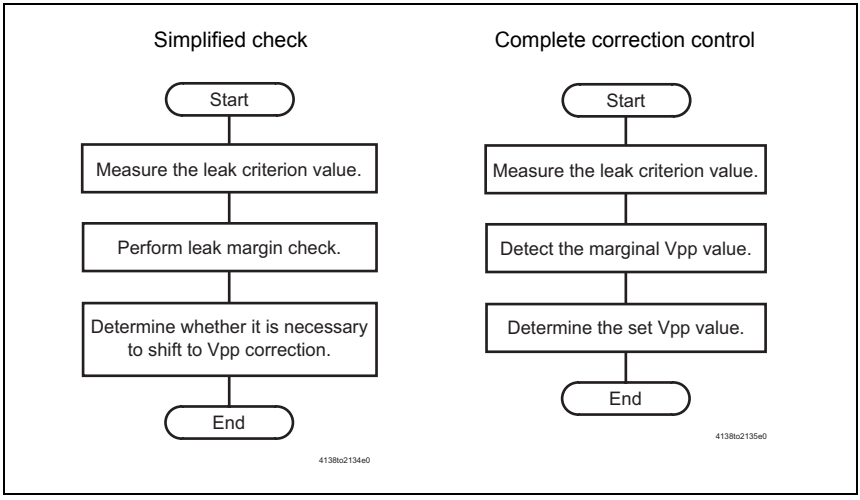
☞ 2-120

A. Simplified check

1. The leak decision criterion value is measured.
2. A leak decision is made based on the data acquired during the last complete correction control.
3. If it is determined that there is no leak occurring, the last Vpp value is applied.
4. If it is determined that there is a leak occurring, the control proceeds to the complete correction and the Vpp correction procedure is performed.

B. Complete correction control

1. The leak decision criterion value is measured.
2. The Vpp value for the leak decision is detected.
3. The leak marginal value is detected.
4. Calculate and determine the set Vpp value based on the leak marginal value.



7.2.5 Developing bias duty control (compensation control of the maximum amount of toner sticking to the Transfer Belt)

- This control corrects to achieve the target amount of toner sticking to the Transfer Belt to form the solid image.
- The duty control may be either the simplified correction or complete correction.
- The developing bias duty control is performed integrally with other control items by the image stabilization control.
- The developing bias duty control is performed when there is a request made for execution of image stabilization sequence.

☞ 2-120

A. Simplified correction control

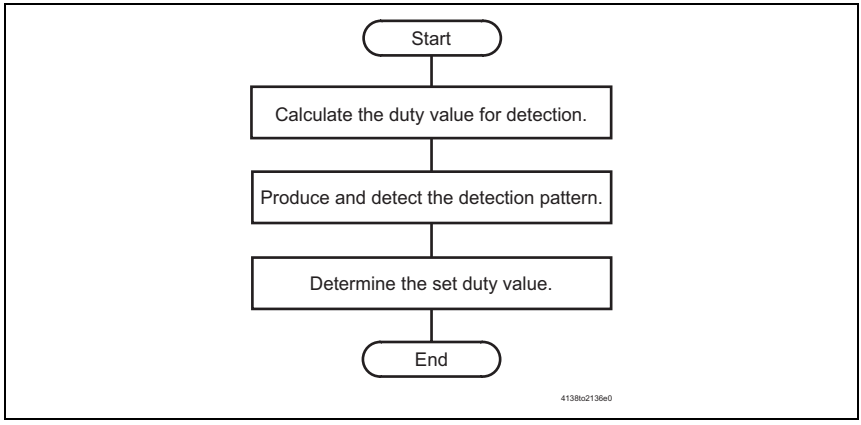
1. The duty value for detection is calculated from the previous setting value.
2. The detection pattern of each color of toner is produced on the Transfer Belt using the calculated duty value for detection.
3. The detection pattern is detected by the AIDC Sensor.
4. If the detected value for at least any one color of toner varies by a predetermined value or more from the duty value set through the last complete correction control, the simplified correction is first made and then the control proceeds to the complete correction control.
5. If the detected value for at least any one color of toner varies by a predetermined value or more from the duty value set through the last gamma correction control, the simplified correction is first made and then the control proceeds to the gamma correction control.

☞ 2-35

6. If the detected value varies only within a predetermined value range, the current setting value is calculated and set based on the previous setting value.

B. Complete correction control

1. The duty value for detection is calculated from the previous setting value.
2. The detection pattern of each color of toner is produced on the Transfer Belt using the calculated duty value for detection.
3. The detection pattern is detected by the AIDC Sensor and the set duty value is determined.



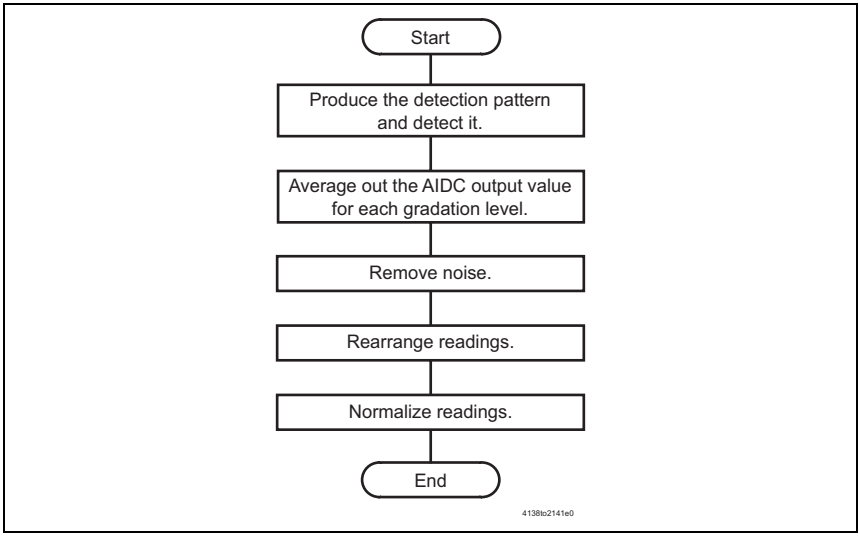
7.2.6 Gamma correction control

- A gradation pattern is produced on the surface of the Transfer Belt. The AIDC Sensor measures the density of this pattern and transmits the results of measurement to the controller for gradation correction.
- The gamma correction is controlled integrally with other control items by the image stabilization control.
- The gamma correction control is performed when there is a request made for execution of image stabilization sequence.

☞ 2-120

A. Correction control

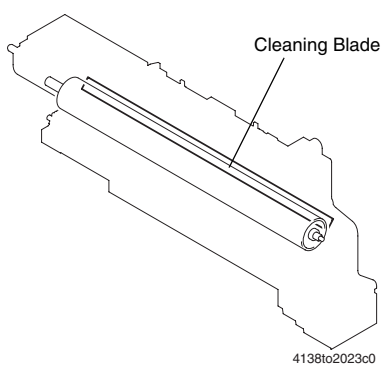
1. A detection pattern of each color of toner is produced on the surface of the Transfer Belt.
2. The detection pattern is detected by the AIDC Sensor.
3. The mean value of the readings taken is calculated.
4. Noise is removed from the mean value.
5. Rearrange the readings in descending order.
6. Normalize the readings.

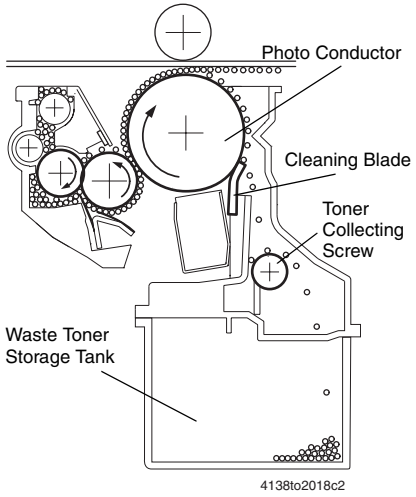


7.2.7 Cleaning mechanism

A. Cleaning operation

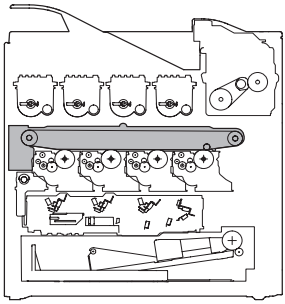
1. The Cleaning Blade is pressed against the surface of the Photo Conductor to remove toner left off the surface (trailing system).
2. The toner, which has been scraped off by the Cleaning Blade, is conveyed by the Toner Collecting Screw and collected in the Waste Toner Storage Tank.
3. The toner is then stored as waste toner in the Waste Toner Storage Tank.
 The waste toner is collected together with the Toner Cartridge when the Toner Cartridge is replaced with a new one. The Waste Toner Storage Tank is not detachable from the cartridge.

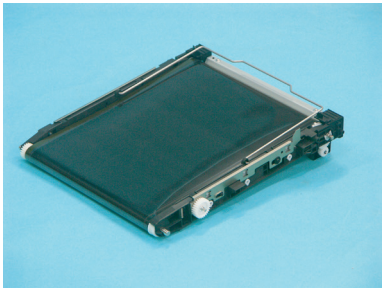




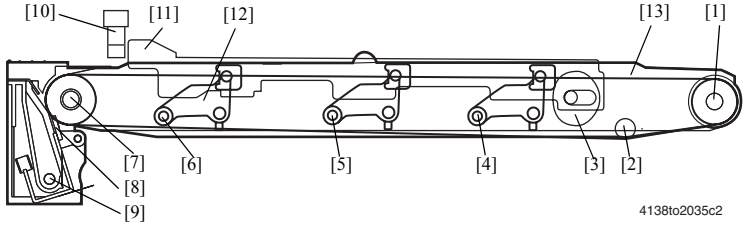
8. 1st Transfer Section

8.1 Composition

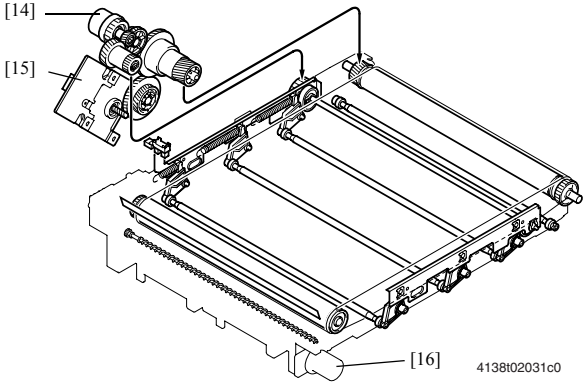




4138to2034c0



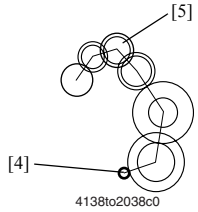
4138to2035c2



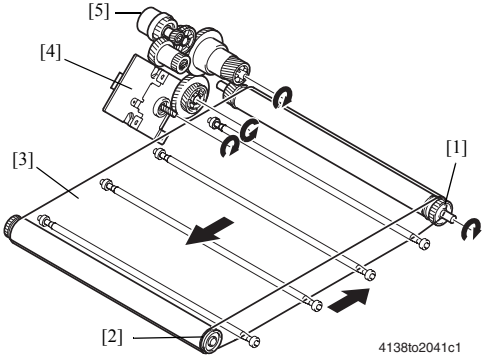
4138t02031c0

Key	Name	Function/system
[1]	Transfer Belt Drive Roller	• Drives the Transfer Belt • Driven by the Intermediate Transport Motor (M3) • Grounded to allow the 2nd transfer current to flow through it
[2]	1st Transfer Roller/K	• Transfers the toner image from the K Photo Conductor to the Transfer Belt (1st transfer) • The transfer voltage (T1) is applied • The applied transfer voltage (T1) has the same potential for all four colors • A transfer Roller retraction mechanism using a Pressure Cam and a Retraction Lever is provided for all rollers but the 1st Transfer Roller/K
[3]	Pressure Cam	• Drives the Sliding Plate
[4]	1st Transfer Roller/C	• Transfers the toner image from each color of Photo Conductor to the Transfer Belt (1st transfer) • The transfer voltage (T1) is applied • The applied transfer voltage (T1) has the same potential for all four colors • The Retraction Lever is operated by an actuator on the machine side • The roller is retracted in the ordinary standby state, monochrome mode, and during image stabilization control
[5]	1st Transfer Roller/M	
[6]	1st Transfer Roller/Y	
[7]	Driven Roller	• Rotated as driven by the Transfer Belt
[8]	Cleaning Blade	• Scrapes residual toner off the surface of the Transfer Belt
[9]	Toner Collecting Screw	• Conveys the toner scraped off by the Cleaning Blade into the Waste Toner Box
[10]	Retraction Position Sensor/1st Image Transfer (PC9)	• Detects the operating condition of the Sliding Plate (retraction of the 1st Transfer Roller)
[11]	Sliding Plate	• Drives the Retraction Lever/Y, M, C
[12]	Retraction Lever/Y, M, C	• Retracts the 1st Transfer Roller/Y, M, C from the Photo Conductor/Y, M, C
[13]	Transfer Belt	• The image of each color of toner is transferred from the 1st Transfer Roller of each color to this Transfer Belt in the order of Y, M, C, and K, thereby forming a full color toner image
[14]	Pressure/Retraction Clutch/1st Image Transfer (CL1)	• Transmits the drive from the Intermediate Transport Motor (M3) to the Pressure Cam • Presses or retracts the 1st Transfer Roller/Y, M, C.
[15]	Intermediate Transport Motor (M3)	• Drives the Transfer Belt • Provides drive also for the conveyance section, 2nd transfer section, media feed section, and other parts • Brushless DC motor
[16]	Toner Collecting Port	• Port through which toner conveyed by the Toner Collecting Screw is dumped into the Waste Toner Box • Provided with a shutter that prevents toner from being spilled

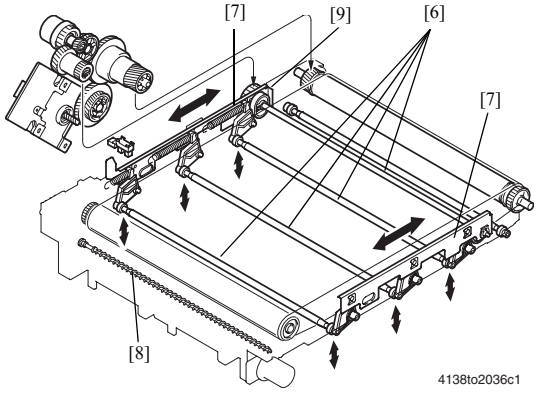
8.2 Drive



Mechanism for driving the belt



Mechanism for driving the pressure/retraction motion



[1] Transfer Belt Drive Roller

[2] Driven Roller

[3] Transfer Belt

[4] Intermediate Transport Motor (M3)

[5] 1st Transfer Roller/Y
Pressure/Retraction Clutch/1st Image Transfer (CL1)

[6] 1st Transfer Roller/Y, /M, /C, /K

[7] Sliding Plate

[8] Toner Collecting Screw

[9] Pressure Cam

8.3 Operation

8.3.1 Transfer Belt speed control

- The Transfer Belt is driven by the Intermediate Transport Motor (M3).
- The appropriate belt speed is selected according to the print mode and media type as detailed below.

Media type/print mode	Belt speed	Reason
Plain paper	1 (standard)	
Thick stock, envelopes, postcards, label OHP film (monochrome print)	1/2 (one-half speed)	To ensure good fusing performance
OHP film (color print)	1/3 (one-third speed)	To ensure good light transmission performance

- For the first print, the machine makes the above decision before starting a print/media feed sequence and, based on the established speed, starts the print/media feed sequence.

8.3.2 1st transfer output control

- To transfer the toner image from the Photo Conductor to the Transfer Belt, the transfer voltage (T1) is applied to the 1st Transfer Roller.
- A charge of the same potential is applied to each of the 1st Transfer Rollers.

A. Color mode pre-process control

1. After rotation of the Intermediate Transport Motor (M3) has been stabilized, the 1st Transfer Roller/Y, M, C is pressed against the Transfer Belt.
2. The transfer voltage (T1) is set according to the system speed, environmental conditions, and other factors.
3. The transfer voltage (T1) is applied.

B. Monochrome mode pre-process control

1. After rotation of the Intermediate Transport Motor (M3) has been stabilized, the transfer voltage (T1) is set according to the system speed, environmental conditions, and other factors.
2. The transfer voltage (T1) is applied.

C. Transfer voltage application timing

- The transfer voltage (T1) is applied after the 1st Transfer Roller/Y, M, C is pressed against the Transfer Belt.
- The transfer voltage (T1) is applied after the 1st Transfer Roller/Y, M, C is pressed against the Transfer Belt through the color change sequence (from monochrome to color, or vice versa).

D. Print control

- The transfer voltage is kept applied during transfer of the toner image.
- The voltage is kept applied even for unexposed areas between two images.

E. Color mode post-process control

1. The transfer output is turned OFF after the last image moves past the 2nd transfer section and before the 1st Transfer Rollers are retracted.

F. Monochrome mode post-process control

1. The transfer output is turned OFF after the last image moves past the 2nd transfer section.

8.3.3 1st Transfer Roller pressure/retraction control

- To extend the service life of the Photo Conductor/Y, M, C, the pressure position of the 1st Transfer Roller is changed between the monochrome mode and the color mode. The 1st Transfer Roller/K is not provided with a retraction mechanism; the Transfer Belt is pressed against the Photo Conductor/K at all times.
- The Intermediate Transport Motor (M3) provides the drive for pressure/retraction operation of the 1st Transfer Roller/Y, M, C. The pressure/retraction sequence is carried out while the Intermediate Transport Motor (M3) and Color PC Drum Motor (M2) turn evenly.

A. Monochrome mode

- The 1st Transfer Roller/Y, M, C is moved inward the unit (for retraction) and the Photo Conductor/Y, M, C is stopped. The transfer roller is moved (retracted) and the Photo Conductor is stopped also in the ordinary standby state.

B. Color mode

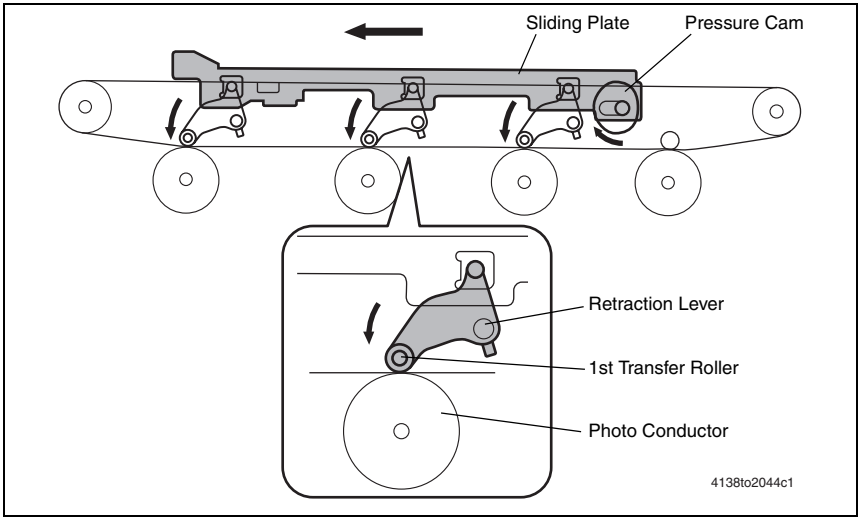
- During the 1st transfer in the color mode, the 1st Transfer Roller/Y, M, C is moved toward the Photo Conductor (pressed) so that Transfer Belt is pressed against the Photo Conductor.

C. Others

- The transfer roller is moved (retracted) and the Photo Conductor is stopped in the ordinary standby state.

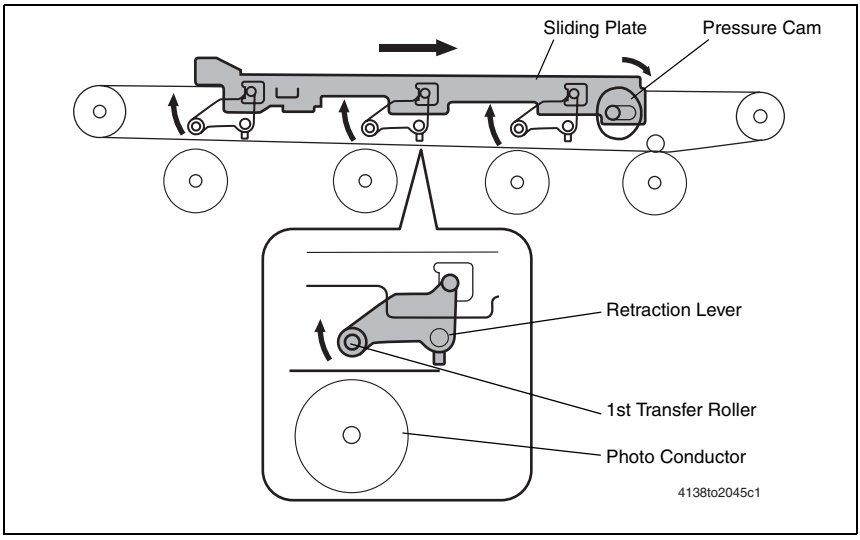
D. Pressure operation

1. Rotation of the Intermediate Transport Motor (M3) is transmitted by a gear train to the Pressure/Retraction Clutch/1st Image Transfer (CL4).
2. Rotation of the Pressure/Retraction Clutch/1st Image Transfer (CL4) turns the Pressure Cam, which moves the Sliding Plate.
3. As the Sliding Plate moves, the Retraction Lever turns.
4. As the Retraction Lever turns, the 1st Transfer Roller is pressed against the Transfer Belt.



E. Retraction operation

1. Rotation of the Intermediate Transport Motor (M3) is transmitted by a gear train to the Pressure/Retraction Clutch/1st Image Transfer (CL4).
2. Rotation of the Pressure/Retraction Clutch/1st Image Transfer (CL4) turns the Pressure Cam, which moves the Sliding Plate.
3. As the Sliding Plate moves, the Retraction Lever turns.
4. As the Retraction Lever turns, the 1st Transfer Roller is retracted from the Transfer Belt.



F. Pressure position control

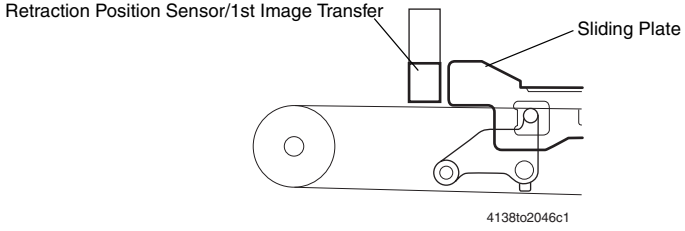
- The pressure and retraction operation of the 1st Transfer Roller is controlled as the Retraction Position Sensor/1st Image Transfer (PC9) detects the movement of the Sliding Plate.

1. The Pressure/Retraction Clutch/1st Image Transfer (CL4) is energized.
2. The Sliding Plate is moved to press the 1st Transfer Rollers up against the Transfer Belt, which blocks the Retraction Position Sensor/1st Image Transfer (PC9).
3. After the lapse of a predetermined period of time after the Retraction Position Sensor/1st Image Transfer (PC9) has been blocked, the Pressure/Retraction Clutch/1st Image Transfer (CL4) is de-energized.

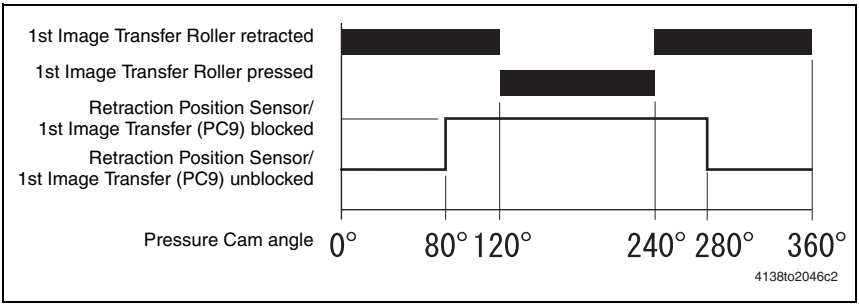
G. Retraction position control

- The pressure and retraction operation of the 1st Transfer Roller is controlled as the Retraction Position Sensor/1st Image Transfer (PC9) detects the movement of the Sliding Plate.

1. The Pressure/Retraction Clutch/1st Image Transfer (CL4) is energized.
2. The Sliding Plate is moved to retract the 1st Transfer Rollers from the Transfer Belt. As a result, the Retraction Position Sensor/1st Image Transfer (PC9), which has been blocked, is now unblocked.
3. After the lapse of a predetermined period of time after the Retraction Position Sensor/1st Image Transfer (PC9) has been unblocked, the Pressure/Retraction Clutch/1st Image Transfer (CL4) is de-energized.



H. Pressure/retraction operation timing



8.3.4 1st Transfer Roller pressure/retraction failure detection control

- The machine monitors the state of the Retraction Position Sensor/1st Image Transfer (PC9) for detection of failures.

A. Detection of failure during pressure operation

- If the Retraction Position Sensor/1st Image Transfer (PC9) is not blocked within a predetermined period of time after the Pressure/Retraction Clutch/1st Image Transfer (CL4) has been energized, the machine determines that there is an Intermediate Transfer Belt pressure failure.

B. Detection of failure during retraction operation

- If the Retraction Position Sensor/1st Image Transfer (PC9) is not unblocked within a predetermined period of time after the Pressure/Retraction Clutch/1st Image Transfer (CL4) has been energized, the machine determines that there is an Intermediate Transfer Belt retraction failure.

C. Detection of pressure/retraction failure during a print cycle

- A media misfeed in control logic results if there is a condition developing in which a pressure/retraction sequence is not carried out at correct timing during the 1st transfer sequence.
- A pressure/retraction sequence is not completed at timing, at which printing starts in the sub scan direction.

D. 1st transfer control provided when a malfunction occurs

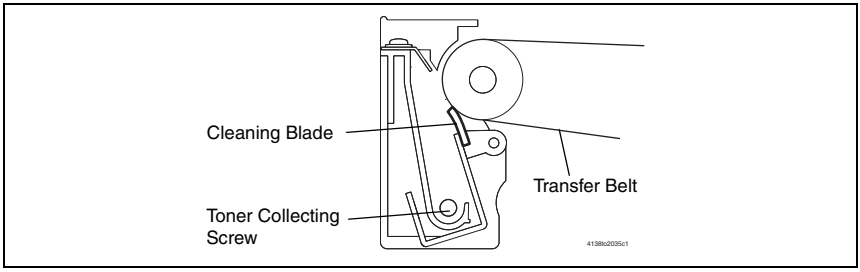
- If a media misfeed or malfunction is detected with a toner image left on any one of the Y, M, C, and K Photo Conductors, the toner image on the Photo Conductor is first transferred onto the Transfer Belt and then the subsequent procedures are performed.

1. It is determined that the machine stops in mid-printing operation due to a media misfeed or malfunction.
2. The output of each laser diode is shut down so as not to form an electrostatic latent image on the surface of the Photo Conductor.
3. The developing bias output for each color is shut down so as not to allow development to take place.
4. The Transfer Belt is driven for the distance between exposure and transfer, thereby transferring the toner image on the surface of the Photo Conductor onto the Transfer Belt. Drive of the Transfer Belt is then stopped.

8.3.5 Transfer Belt cleaning

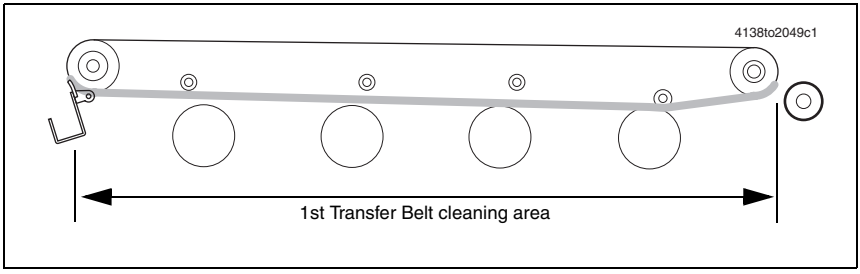
- To scrape residual toner off the surface of the Transfer Belt, the Transfer Belt is provided with a Cleaning Blade.
- The Cleaning Blade is in pressed contact with the Transfer Belt at all times. That is, it cleans the surface of the Transfer Belt as long as the belt turns.
- The Toner Collecting Screw conveys toner scraped off by the Cleaning Blade into the Waste Toner Box.

☞ 2-57



A. 1st Transfer Belt cleaning control

- If there is a possibility of the machine being stopped with toner left on the surface of the Transfer Belt between the Cleaning Blade position and the 2nd transfer position (due to a media misfeed or malfunction), the Intermediate Transport Motor (M3) is energized to turn the Transfer Belt. The residual toner is thereby removed from the Transfer Belt.
- No forced cleaning sequence is carried out to clean the entire surface of the Transfer Belt.



B. 1st Transfer Belt cleaning operation timing

- The 1st transfer cleaning sequence is carried out before the 2nd transfer cleaning as part of the initial operation sequence.
- The 1st transfer cleaning sequence is carried out before the ATVC 2nd transfer cleaning sequence.

C. 1st Transfer Belt backward rotation control

- To prevent paper dust, toner, and other foreign matter from being wedged in the Cleaning Blade while the Transfer Belt remains stationary, the Transfer Belt is turned backward so that the foreign matter can be removed.
- Once the Transfer Belt is started turning backward, this operation takes precedence over any other request for energizing the Intermediate Transport Motor (M3). Such a request is honored after the backward rotation control is completed.
- The backward rotation control is not executed at high temperatures.

D. 1st Transfer Belt backward rotation execution conditions

- After the lapse of a predetermined period of time after the Transfer Unit stop sequence.
- A predetermined number of printed pages are produced after the execution of the last backward rotation control.

E. 1st Transfer Belt backward rotation operation

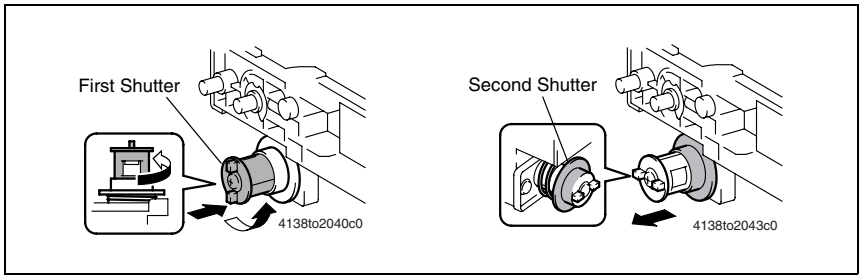
1. The machine remains in the standby state for a predetermined period of time after the Transfer Unit has been brought to a stop.
2. After the lapse of another predetermined period of time, the Intermediate Transport Motor (M3) is turned backward for a predetermined period of time.
3. After the Transfer Belt has been turned backward, the machine remains in the standby state for a predetermined period of time.

8.3.6 Toner Collecting Port Shutter mechanism

- A dual-shutter mechanism is provided to prevent waste toner from being spilled from the Toner Collecting Port when the Waste Toner Box is removed and reinstalled.

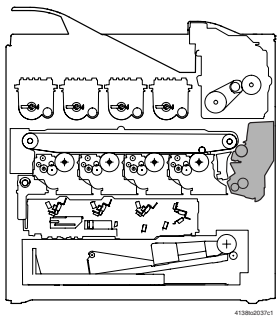
1. Placing the Lock Lever of the Waste Toner Box in the “locked” position (the 9 o'clock position) closes the First Shutter of the Toner Collecting Port.
2. Removing the Waste Toner Box closes the Second Shutter.

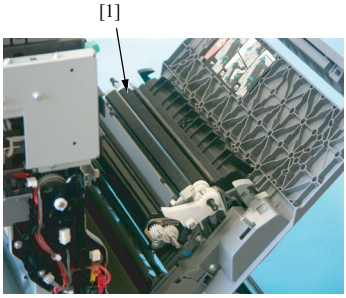
☞ 2-57



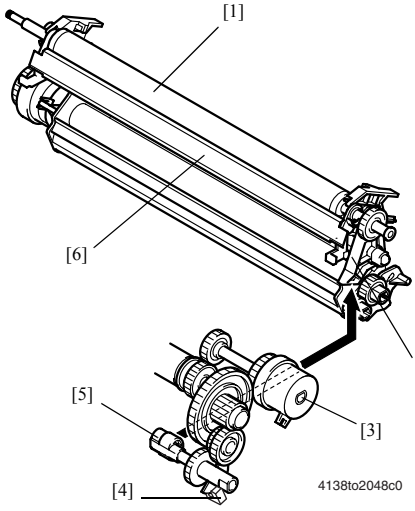
9. 2nd Transfer Section

9.1 Composition

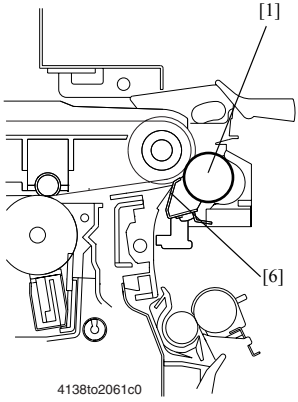




4138to2096c0



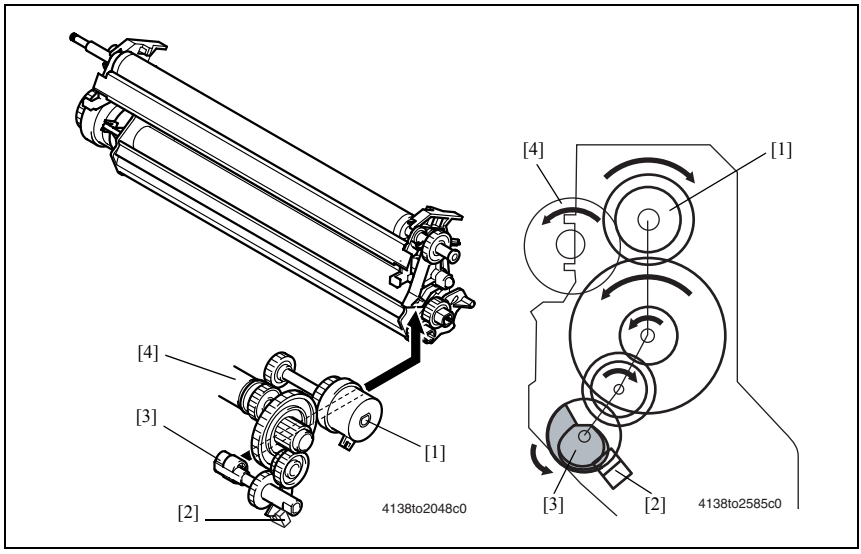
4138to2048c0



4138to2061c0

Key	Name	Function/system
[1]	2nd Transfer Roller	• Transfers the toner images in four colors of toner on the Transfer Belt to the media • Constant voltage control (ATVC) system
[2]	Retraction Lever	• Retracts the 2nd Transfer Roller
[3]	Pressure/Retraction Clutch/2nd Image Transfer (CL5)	• Transmits the drive from the Intermediate Transport Motor (M3) to the Retraction Cam
[4]	Retraction Position Sensor/2nd Image Transfer (PC10)	• Detects the operating condition of the Retraction Cam (retraction of the 2nd Transfer Roller)
[5]	Retraction Cam	• Drives the Retraction Lever • Drives the AIDC Sensor Lever
[6]	Pre-transfer Guide Plate	• Presses the media up against the Transfer Belt in a stage before the 2nd transfer

9.1.1 Drive



[1] Pressure/Retraction Clutch/2nd Image Transfer (CL5)

[2] Retraction Position Sensor/2nd Image Transfer (PC10)

[3] Retraction Cam

[4] Transfer Belt drive roller

9.2 Operation

9.2.1 2nd Transfer Roller pressure mechanism

- The machine is provided with a mechanism that presses the 2nd Transfer Roller up against, and retracts it from, the Transfer Belt. This is done to prevent the 2nd Transfer Roller from being dirtied due to patterns produced for purposes other than an actual printing operation. Such patterns may be produced during the image stabilization sequence or another function.

A. 2nd Transfer Roller pressure

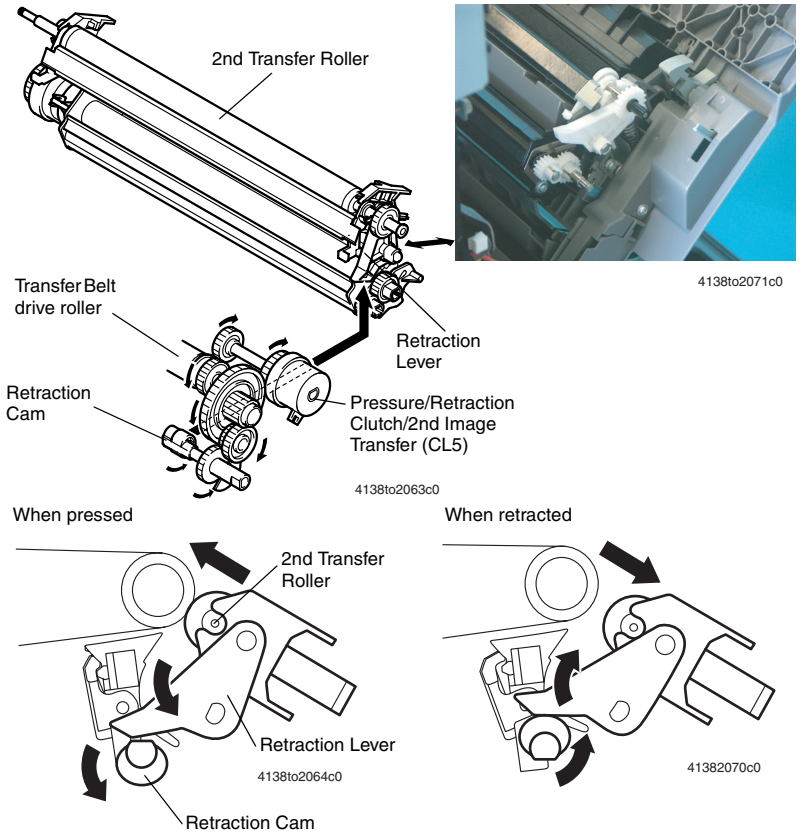
- The 2nd Transfer Roller is pressed against the Transfer Belt to allow the toner image on the Transfer Belt to be transferred onto the media.
- The 2nd Transfer Roller is pressed against the Transfer Belt to allow the roller to be cleaned.

B. 2nd Transfer Roller retraction

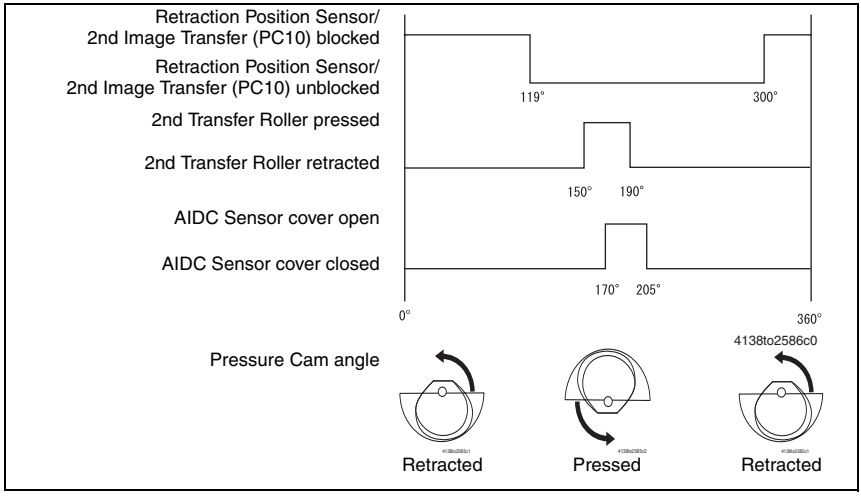
- The 2nd Transfer Roller is retracted from the Transfer Belt when a detection pattern is produced on the Transfer Belt for registration correction control, image stabilization control, or other control.
- The 2nd Transfer Roller is retracted from the Transfer Belt when the toner image on the Transfer Belt cannot be transferred to the media due to a paper empty condition occurring during printing.
- The 2nd Transfer Roller is retracted from the Transfer Belt after the 2nd transfer of the last image is completed during a multi-print cycle.

C. Pressure/retraction operation

1. Rotation of the Intermediate Transport Motor (M3) is transmitted to the drive roller of the Intermediate Transfer Belt Unit.
2. Rotation of the drive roller is transmitted to the Pressure/Retraction Clutch/2nd Image Transfer.
3. When the Pressure/Retraction Clutch/2nd Image Transfer is energized, the rotation is transmitted to the Pressure Cam via a coupling gear.
4. When the Pressure Cam turns a half turn to push up the Pressure Lever, the 2nd Transfer Roller is pressed against the Transfer Belt.
5. At the same time, the AIDC Sensor Lever is pushed up to open the AIDC Sensor Cover.
6. The light blocking plate fitted on the shaft of the Pressure Cam blocks the Retraction Position Sensor/2nd Image Transfer (PC10) and a pressed position of the 2nd Transfer Roller is detected.
7. When the Pressure/Retraction Clutch/2nd Image Transfer is energized a second time, the Pressure Cam is turned another half turn. This releases the Pressure Lever, causing the 2nd Transfer Roller to be retracted from the Transfer Belt. At the same time, the AIDC Sensor Lever is released, which closes the AIDC Sensor Cover.
8. The light blocking plate unblocks the Retraction Position Sensor/2nd Image Transfer (PC10) and a retracted position of the 2nd Transfer Roller is detected.



D. Pressure/retraction operation

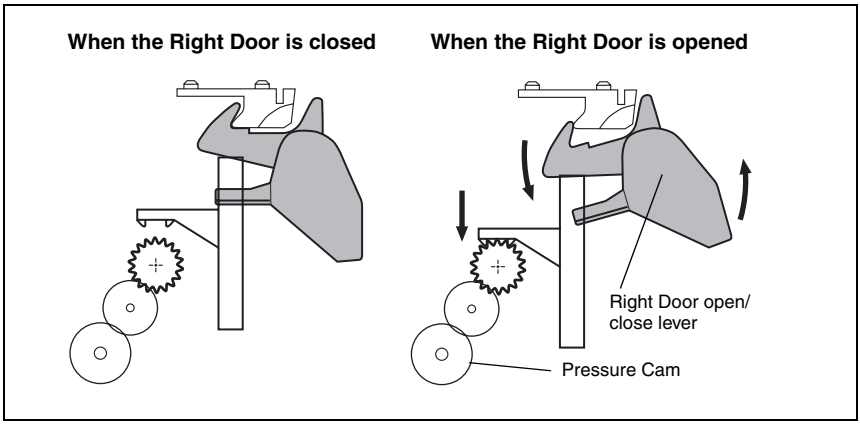


9.2.2 2nd Transfer Roller pressure position deviation preventive mechanism

- When the Right Door is opened and closed, the Pressure Cam is rotated to prevent the 2nd Transfer Roller from deviating from the pressure position.

A. Operation

- The lever moves up or down as the Right Door is opened or closed, thereby locking rotation of the coupling gear that drives the Pressure Cam.



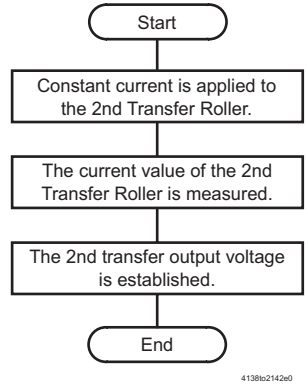
9.2.3 2nd transfer voltage control

- The transfer voltage (T2) is applied to the 2nd Transfer Roller in order to transfer the toner image from the Transfer Belt to the media.
- The transfer voltage (T2) is applied after the 2nd Transfer Roller has been pressed against the Transfer Belt.

9.2.4 2nd transfer voltage setting control (ATVC: Auto Transfer Voltage Control)

- The transfer voltage (T2) is corrected to reduce effect from the Transfer Belt and environmental changes of toner.

A. Overview of 2nd transfer ATVC operation



B. 2nd transfer ATVC operation timing

- The ATVC control operation is performed for every period of time equivalent to a predetermined number of printed pages produced.
- The control operation is performed when the Intermediate Transfer Belt Unit is replaced with a new one (as started when the Transfer Belt time counter is reset).
- Execution of the transfer ATVC control is, as a rule, synchronized with the image stabilization control. The image stabilization sequence is carried out after the execution of the ATVC control.

☞ 2-118

C. 2nd transfer ATVC operation

1. The Transfer Belt is driven as in the monochrome mode (but charging, developing, or 1st transfer operation is not performed).
2. The 2nd Transfer Roller is pressed against the Transfer Belt.
3. A constant current is applied to the 2nd Transfer Roller.
4. The voltage value is read and, using a conversion formula, the output value of the transfer voltage (T2) is determined.
5. The established output value is backed up and the transfer output is produced according to the environment before the print cycle is started.
6. The last output value is used when an ATVC detection error occurs.

9.2.5 2nd transfer voltage fine-adjustment control

- The voltage value established through the ATVC control is fine-adjusted according to the type of media.
- The following adjustment values are used for labels, coated stock, and recycled paper, for which no setting values are defined.

Type of media	Adjustment value
Plain paper, recycled paper	Plain paper
OHP film	OHP film
Thick stock 1, coated stock	Thick stock 1
Thick stock 2	Thick stock 2
Postcards	Postcards
Envelopes, labels	Envelopes

9.2.6 2nd Transfer Roller pressure/retraction failure detection control

- The machine monitors the state of the Retraction Position Sensor/2nd Image Transfer (PC10) for detection of failures.

A. Detection of failure during pressure operation

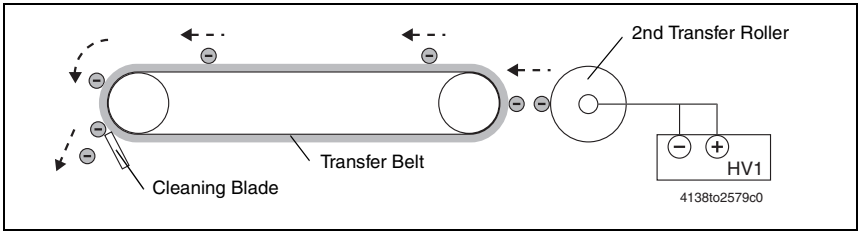
- If the Retraction Position Sensor/2nd Image Transfer (PC10) is not blocked within a predetermined period of time after the 2nd Transfer Roller pressure sequence has been started, the machine determines that there is a 2nd Transfer Roller pressure/retraction failure.
- The machine considers that there is a control misfeed if the 2nd Transfer Roller is retracted when it should be pressed.

B. Detection of failure during retraction operation

- If the Retraction Position Sensor/2nd Image Transfer (PC10) is not unblocked within a predetermined period of time after the 2nd Transfer Roller pressure sequence has been started, the machine determines that there is a 2nd Transfer Roller pressure/retraction failure.

9.2.7 2nd Transfer Roller cleaning control

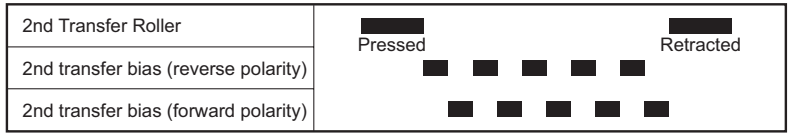
- DC positive and negative transfer bias voltages are alternately applied to the 2nd Transfer Roller. This allows toner residue on the surface of the 2nd Transfer Roller to be transferred back to the Transfer Belt, thus cleaning the 2nd Transfer Roller.
- Any voltage for other control purposes is not applied during the cleaning procedure.
- The toner transferred back to the Transfer Belt is collected by the Cleaning Blade.



9.2.8 2nd Transfer Roller cleaning operation timing

- The 2nd Transfer Roller cleaning sequence is carried out after the Intermediate Transfer Belt has been cleaned during recovery from a media misfeed or malfunction.
- The cleaning sequence is carried out if 100 printed pages are produced after the last cleaning sequence.
- The cleaning sequence is carried out when a media size error occurs.

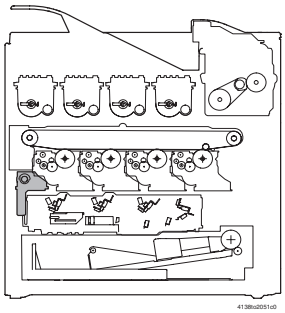
1. The 2nd Transfer Roller is pressed.
2. The 2nd transfer bias voltage of reverse polarity is applied for the period of time corresponding to one revolution of the 2nd Transfer Roller.
3. The 2nd transfer bias voltage of forward polarity is applied for the period of time corresponding to one revolution of the 2nd Transfer Roller.
4. Steps 2 and 3 are repeated five times.
5. The 2nd Transfer Roller is retracted.

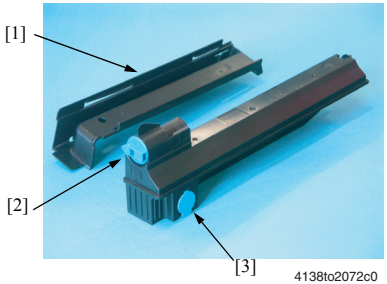


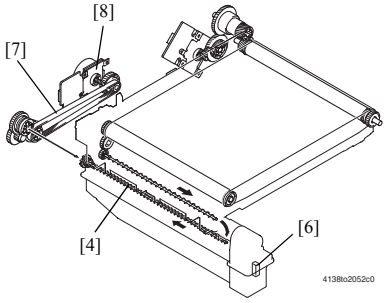
4138to2148e0

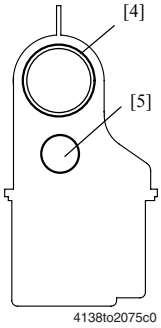
10. Toner Collecting Section

10.1 Composition



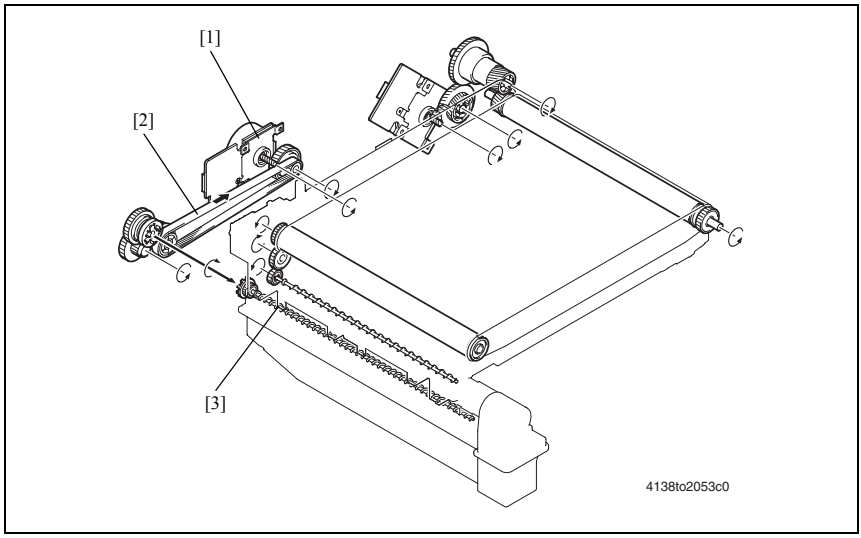






Key	Name	Function/system
[1]	Box Tray	• Tray on which the Waste Toner Box is mounted • Moves up or down depending on the weight of the waste toner collected, thus blocking the Waste Toner Full Sensor (PC11)
[2]	Box Lock Lever	• Used to secure the Waste Toner Box in position • Placing the lever in the unlock position opens the Shutter
[3]	Cap	• Prevents toner from being spilled
[4]	Shutter	
[5]	Toner Collecting Screw	• Conveys toner fed from the Intermediate Transfer Unit into the Waste Toner Box
[6]	Waste Toner Full Sensor (PC11)	• Detects the amount of waste toner
[7]	Belt	• Transmits drive from the Developing Motor to the Toner Collecting Screw
[8]	Developing Motor/K (M5)	• Drives the Toner Collecting Screw in the Waste Toner Box via a belt • Drives also the K Developing Unit • Brushless DC motor

10.2 Drive



[1] Developing Motor/K (M5)
[2] Belt
[3] Toner Collecting Screw

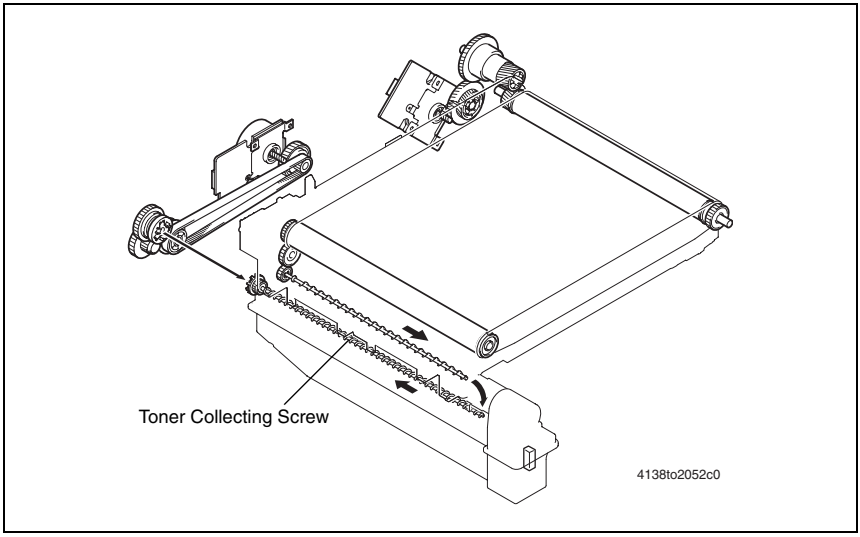
10.3 Operation

10.3.1 Toner collecting mechanism

- Toner scraped off by the Cleaning Blade of the Intermediate Transfer Belt Unit is conveyed into the Waste Toner Box.

☞ 2-45

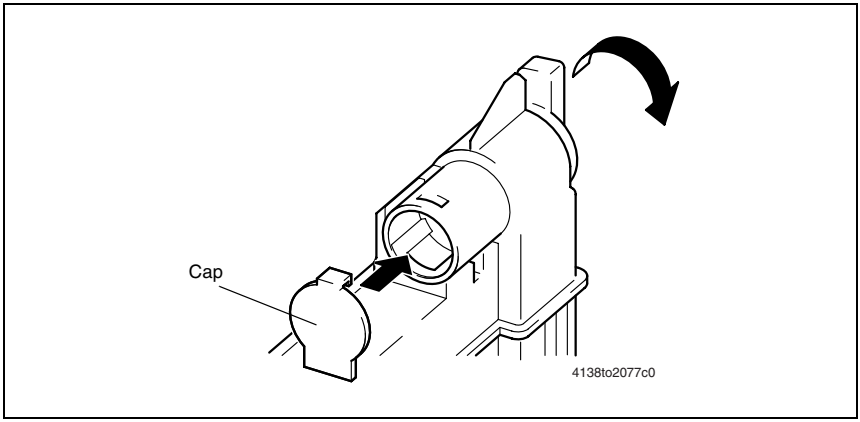
- The toner is conveyed into the Waste Toner Box by the Toner Collecting Screw provided in the Waste Toner Box.



10.3.2 Toner Collecting Port Shutter mechanism

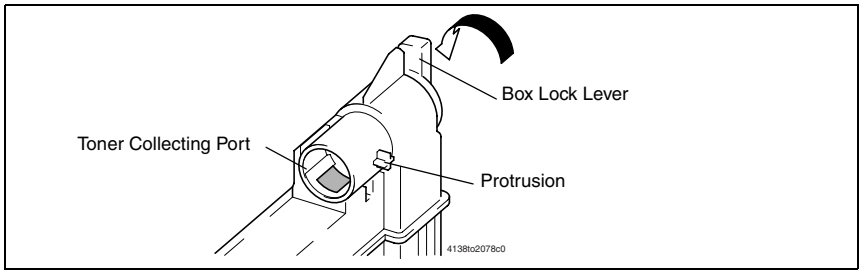
- A shutter and a cap are used to prevent waste toner from being spilled from the Toner Collecting Port when the Waste Toner Box is removed and reinstalled.

1. Placing the Box Lock Lever of the Waste Toner Box in the “locked” position (the 9 o'clock position) closes the Shutter of the Toner Collecting Port.
2. After the Waste Toner Box has been removed, plug the Toner Collecting Port with the cap fitted to the side face of the box.



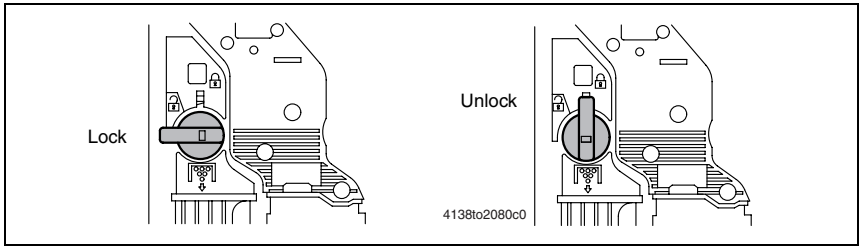
10.3.3 Waste Toner Box locking mechanism

- When the Box Lock Lever is in the unlocked position (the 12 o'clock position), the protrusion provided at the Toner Collecting Port interferes with the machine frame, thus preventing the Waste Toner Box from being removed.
- When the Box Lock Lever is in the locked position (the 9 o'clock position), the Waste Toner Box can be removed.



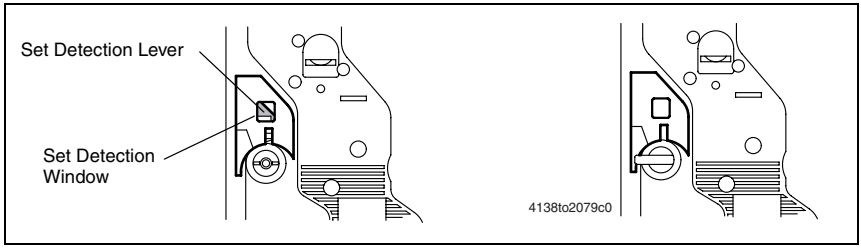
10.3.4 Waste Toner Box locked position detection mechanism

- When the Box Lock Lever is in the locked position (the 9 o'clock position), the protrusion provided in the Front Door interferes with the Box Lock Lever. As a result, the Front Door cannot be closed.
- When the Box Lock Lever is in the unlocked position (the 12 o'clock position), the Front Door can be closed.



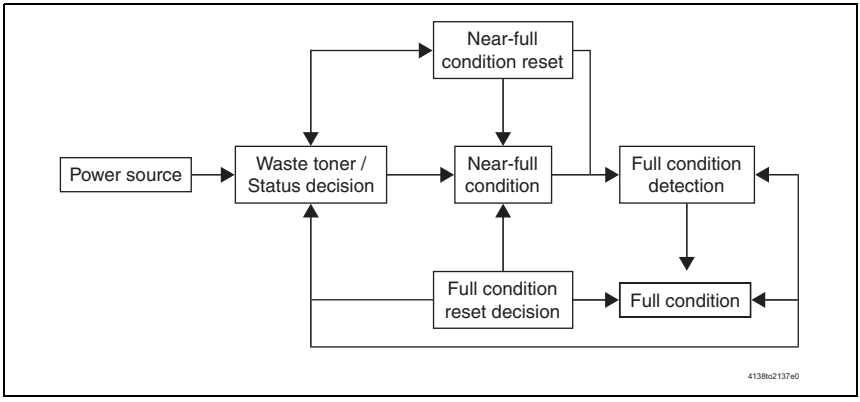
10.3.5 Waste Toner Box-in-position detection mechanism

- The Waste Toner Box Set Detection Lever is provided to detect a Waste Toner Box loaded in position.
- When the Waste Toner Box is not loaded, the Set Detection Lever lowers by its own weight to plug the Set Detection Window.
- The protrusion provided in the Front Door interferes with the Set Detection Lever that plugs the Set Detection Window. Then, the Front Door cannot be closed.
- When the Waste Toner Box is loaded in position, it pushes up the Set Detection Lever to uncover the Set Detection Window.



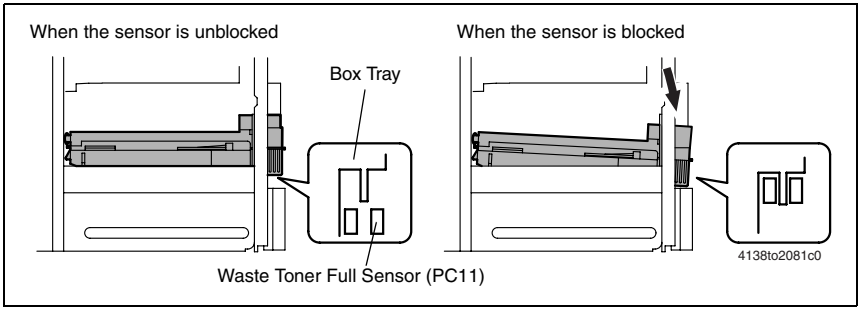
10.3.6 Waste toner near-full condition detection

- A waste toner near-full condition is detected using the output state of the Waste Toner Full Sensor.
- A waste toner full condition is detected based on the dot count.
- The output value of the Waste Toner Full Sensor cannot be acquired during the AIDC control (registration correction, gamma correction). During this period, therefore, the following control procedures are not performed: “waste toner status decision,” “waste toner full condition reset decision,” “waste toner near-full condition reset decision,” and “waste toner near-full condition detection control.”



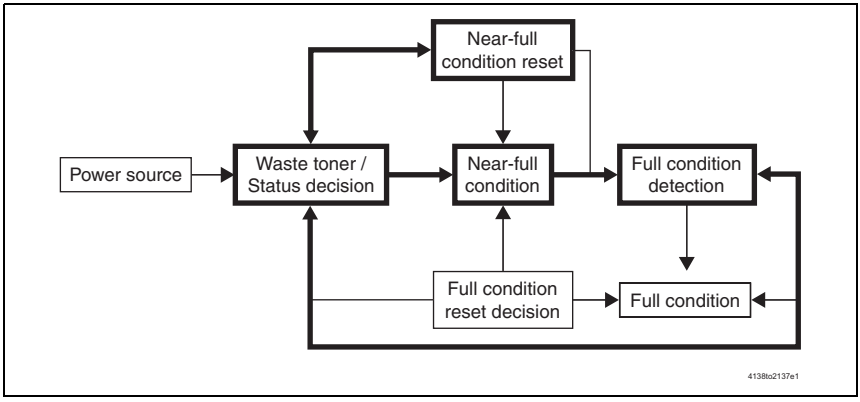
A. Waste toner near-full condition detection control

- A waste toner near-full condition is detected when the Waste Toner Full Sensor (PC11) continuously outputs a voltage of a predetermined value or more for a predetermined period of time or more.
- At this time, a waste toner near-full condition warning is given on the panel.
- To prevent false detection, a conveying screw is installed in the Waste Toner Box, ensuring that waste toner is uniformly accumulated in the box.



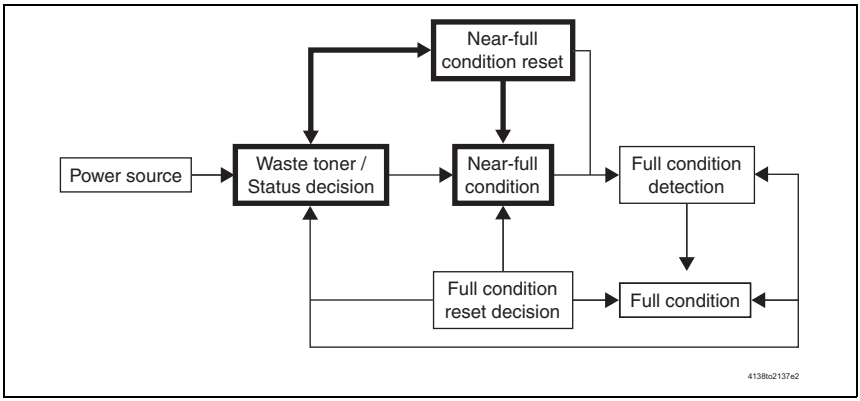
B. Waste toner status decision after detection of a waste toner near-full condition

- Opening and closing the Front Door resets a waste toner near-full condition. The control state then proceeds to “waste toner status decision.”
- If the Waste Toner Full Sensor (PC11) produces an output of a predetermined voltage or more for a continuous period of a predetermined time a second time during “waste toner status decision,” the control state proceeds to “waste toner full detection.”
- If the Waste Toner Full Sensor (PC11) does not produce an output of a predetermined voltage or more for a continuous period of a predetermined time during “waste toner status decision,” the control state proceeds to “waste toner near-full condition reset decision.”



C. Waste toner near-full condition reset decision after detection of a waste toner near-full condition

- If a waste toner near-full condition is not detected during “waste toner status decision,” a “waste toner near-full condition reset decision” is made. (Control for preventing false detection of a waste toner near-full condition.)
- If a waste toner near-full condition is not detected a second time when the number of print dots (waste toner detection dot count) reaches a predetermined value after the Front Door has been closed, the waste toner near-full condition is reset. If a waste toner near-full condition is detected a second time, the machine determines that there is a waste toner near-full condition.
- If a waste toner near-full condition is detected a second time before the number of print dots (waste toner detection dot count) reaches a predetermined value after the Front Door has been closed, the machine determines that there is a waste toner near-full condition.



10.3.7 Waste toner full condition detection control

A. Waste toner full condition detection control

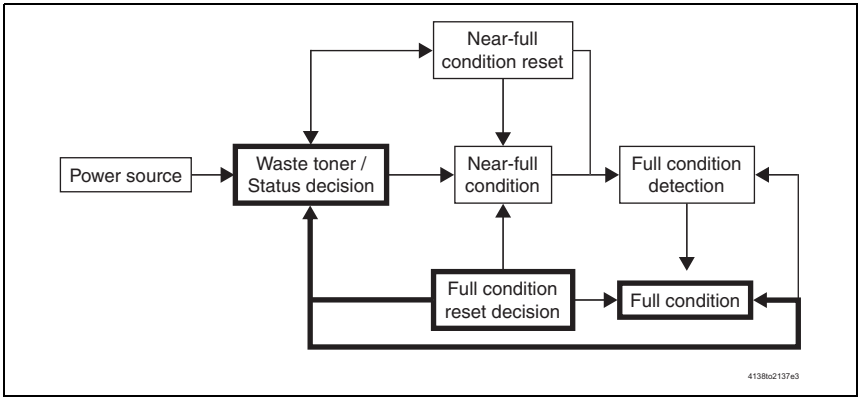
- A waste toner full condition is detected when the cumulative total number of print dots (waste toner detection dot count) exceeds a predetermined value after a Waste Toner Box near-full condition has been detected.
- A waste toner full condition warning is given on the panel at this time.
- The machine accepts no print job after the waste toner full condition has been detected.

B. Waste toner dot count

- The waste toner dot count is taken since the waste toner near-full condition was detected.

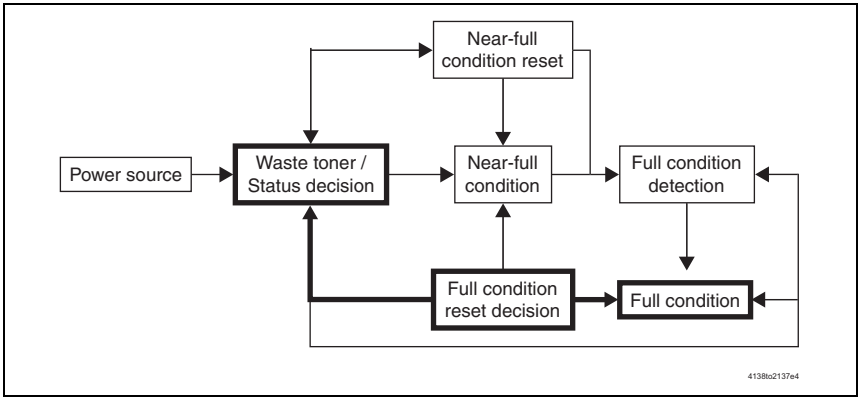
C. Waste toner status decision after detection of a waste toner full condition

- Opening and closing the Front Door resets a waste toner full condition. The control state then proceeds to “waste toner status decision.”
- If the Waste Toner Full Sensor (PC11) continuously outputs a voltage of a predetermined value or more for a predetermined period of time or more during “waste toner status decision,” the control state proceeds to “full condition.”
- If the Waste Toner Full Sensor (PC11) does not output continuously a voltage of a predetermined value or more for a predetermined period of time or more during “waste toner status decision,” the control state proceeds to “waste toner full condition reset decision.”



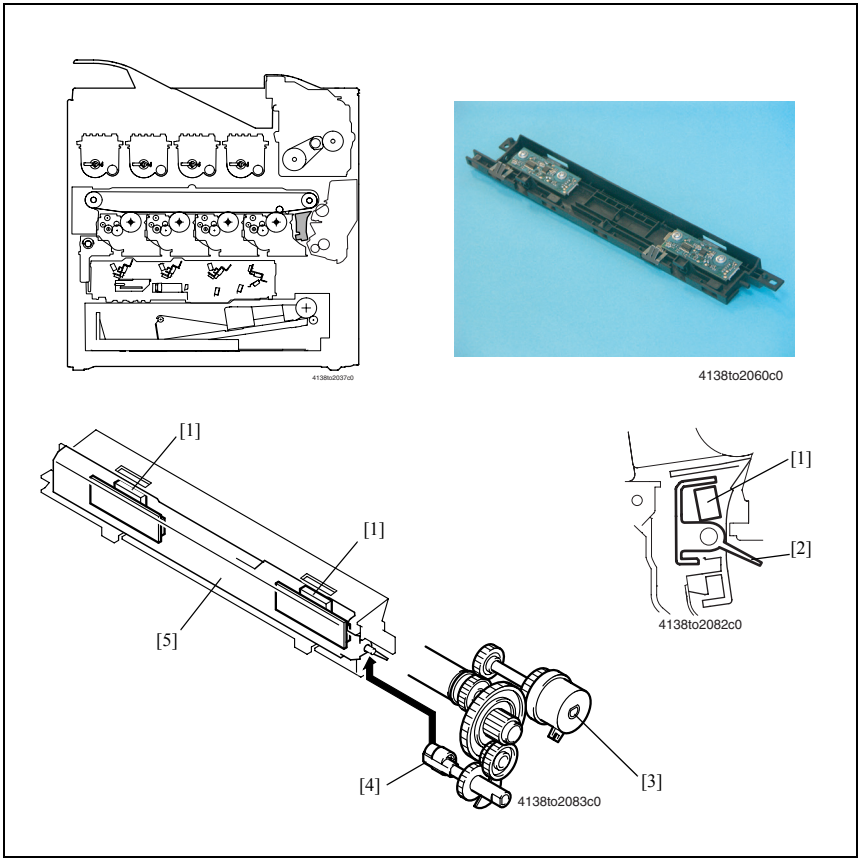
D. Waste toner full condition reset decision after detection of a waste toner full condition

- If the Waste Toner Full Sensor (PC11) does not output continuously a voltage of a predetermined value or more for a predetermined period of time or more during “waste toner status decision,” a “waste toner full condition reset decision” is made. (Control for preventing false detection of a waste toner full condition.)
- If the Waste Toner Full Sensor (PC11) continuously outputs a voltage of a predetermined value or less for a predetermined period of time when the number of print dots (waste toner detection dot count) reaches a predetermined value after the Front Door has been closed, the waste toner full condition is reset.
- If the Waste Toner Full Sensor (PC11) continuously outputs a voltage of a predetermined value or more for a predetermined period of time before the number of print dots (waste toner detection dot count) reaches a predetermined value after the Front Door has been closed, the machine determines that there is a waste toner full condition.



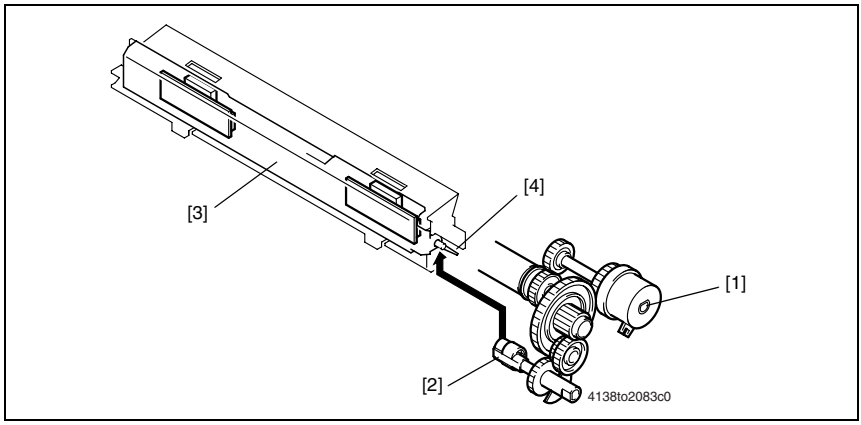
11. AIDC Sensor

11.1 Composition



Key	Name	Function/system
[1]	AIDC Sensor/Rt, Lt (AIDC R/L)	• Detects the density of the toner on the Intermediate Transfer Belt
[2]	AIDC Sensor Lever	• Drives the AIDC Sensor Cover
[3]	Pressure/Retraction Clutch/2nd Image Transfer (CL5)	• Transmits the drive from the Intermediate Transport Motor (M3) to the Retraction Cam
[4]	Retraction Cam	• Drives the Retraction Lever • Drives the AIDC Sensor Lever
[5]	AIDC Sensor Cover	• Protects the AIDC Sensor

11.1.1 Drive

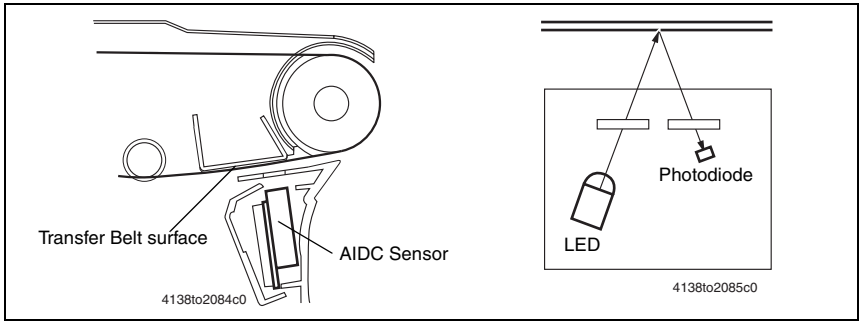


[1] Pressure/Retraction Clutch/2nd Image Transfer (CL5)
[2] Retraction Cam
[3] AIDC Sensor Cover
[4] AIDC Sensor Lever

11.2 Operation

11.2.1 Toner density detection control

- A reflective sensor is used for the AIDC Sensor that detects the amount of toner sticking to the surface of the Transfer Belt. Image stabilization is performed based on the value detected.
- The detection pattern (toner image) produced on the surface of the Transfer Belt is irradiated with light emitted by the LED of the sensor.
- The photodiode of the sensor detects the light reflected off the toner pattern on the surface of the Transfer Belt.



- A voltage corresponding to the intensity of the light reflected off the toner pattern is output to the Mechanical Control Board (PWB-A).

Amount of toner sticking	Intensity of light reflected	Output
Large	Small	Low
Small	Great	High

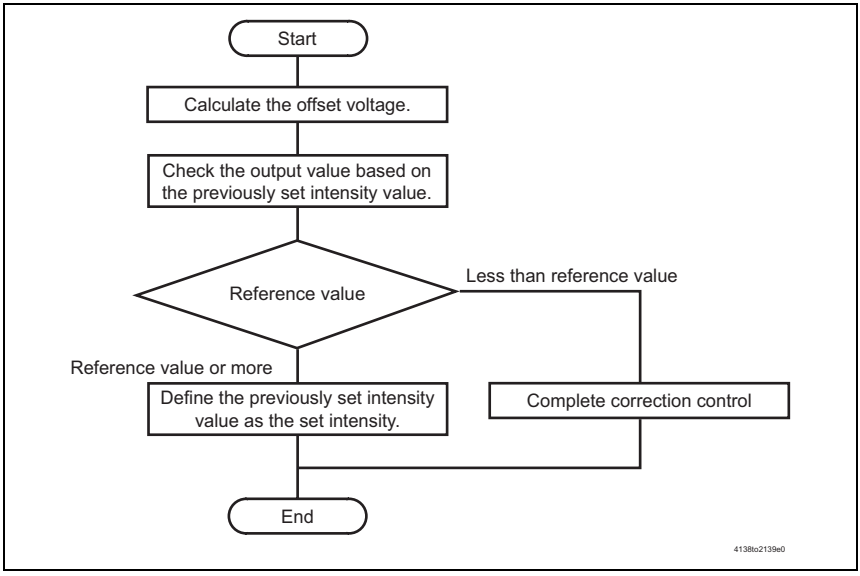
11.2.2 AIDC Sensor calibration control

- Changes in various types of characteristics due to change with time of the AIDC Sensor (deteriorated LED, dirty sensor surface), part-to-part variations in the sensors, and change of environment affect the AIDC Sensor output corresponding to the clear Transfer Belt surface. To correct fluctuations in the output, the sensor LED intensity is adjusted so as to keep constant the AIDC Sensor output value.
- The AIDC Sensor calibration control may be either the simplified check or complete correction.
- The AIDC Sensor calibration is controlled integrally with other control items by the image stabilization control.
- The AIDC Sensor calibration control is performed when there is a request made for execution of image stabilization sequence.

☞ 2-120

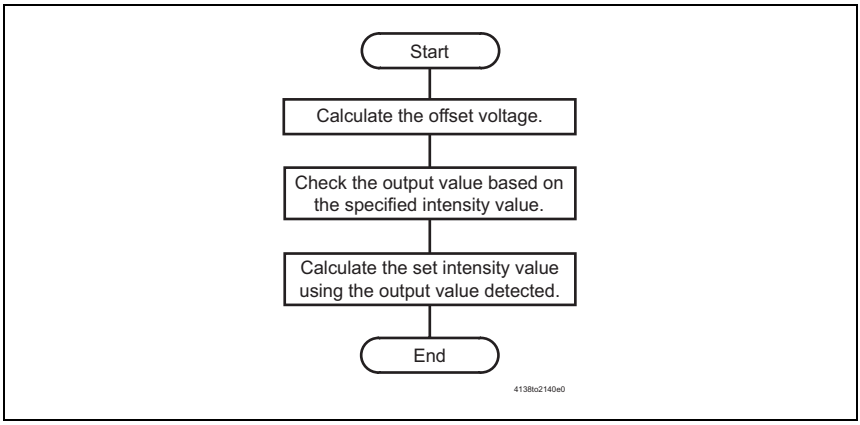
A. Simplified correction control

1. The offset voltage of the AIDC Sensor is calculated.
2. A simplified detection pattern of each color of toner is produced on the surface of the Transfer Belt.
3. The LED is illuminated with the intensity value set last to let the AIDC Sensor detect the output value.
4. If the output value is a predetermined value or more, the intensity value set last becomes the current setting value.
5. If the output value is less than the predetermined value, the control proceeds to the complete correction.



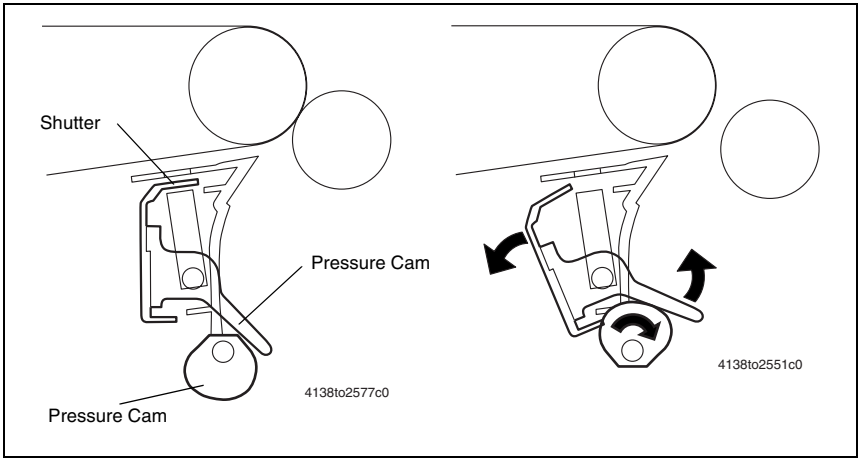
B. Complete correction control

1. The offset voltage of the AIDC Sensor is calculated.
2. A complete detection pattern of each color of toner is produced on the surface of the Transfer Belt.
3. The LED is illuminated with each of the specified intensity values and the output value for each LED intensity value is detected using the AIDC Sensor.
4. The intensity setting value is calculated from the output value detected.



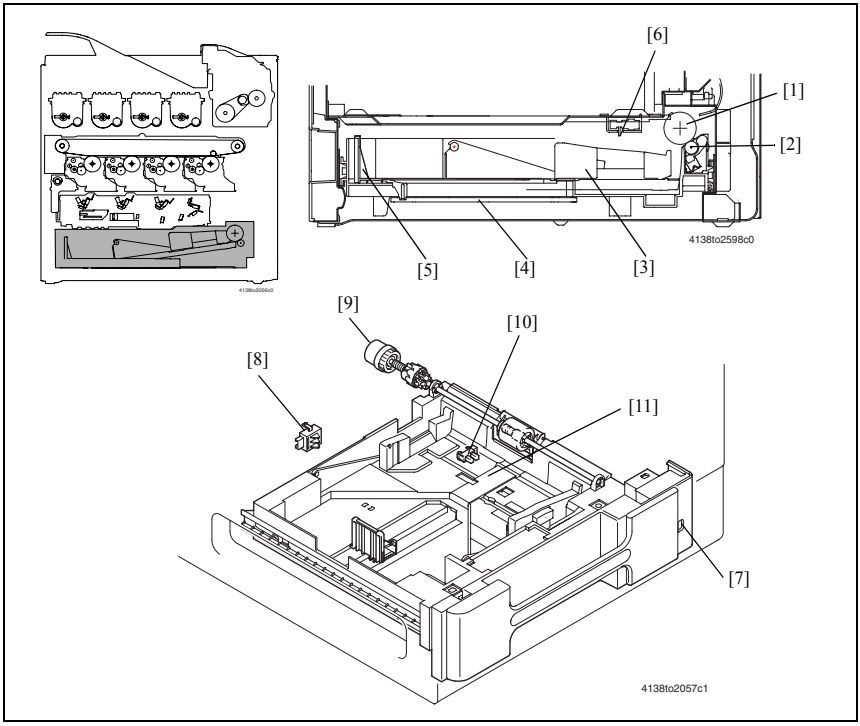
11.2.3 AIDC Sensor shutter mechanism

- Since the AIDC Sensor is installed below the Transfer Belt, it can be dirtied with toner or other foreign matter. A shutter mechanism is therefore provided above the AIDC Sensor to prevent it from being dirtied.
- The shutter is opened or closed in synchronism with the pressure or retraction motion of the 2nd Transfer Roller. When the 2nd Transfer Roller is pressed, the Pressure Cam pushes up the Sensor Lever, which opens the shutter above the AIDC Sensor.
- When the 2nd Transfer Roller is released, the shutter above the AIDC Sensor is closed by the tension of a spring.



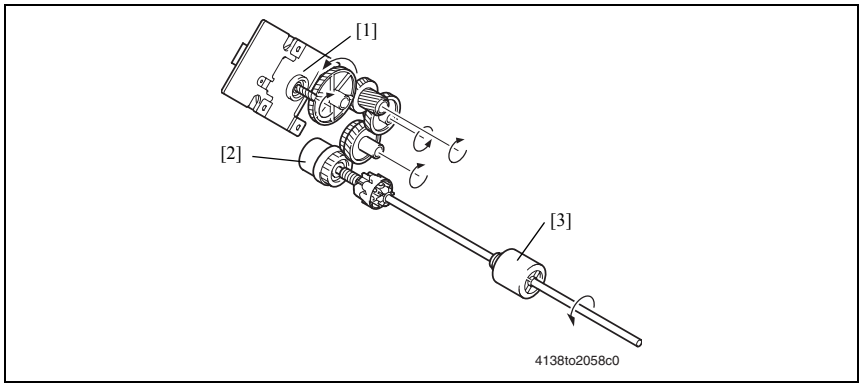
12. Media Feed Section (magicolor 5430 DL)

12.1 Composition



Key	Name	Function/system
[1]	Tray 1 Feed Roller	• Takes up and feeds media from Tray 1
[2]	Tray 1 Separation Roller	• Separates media in Tray 1 • Small-diameter roller with a torque limiter
[3]	Edge Guide Plate	• Aligns the edges of the media stack in Tray 1
[4]	Size Detection Board	• Detects the length of the media loaded in Tray 1
[5]	Trailing Edge Guide Plate	• Aligns the trailing edges of the media stack in Tray 1
[6]	Empty Sensor Actuator	• Detects the media level in Tray 1
[7]	Paper Level Indicator Lever	• Indicates the level of the media still available for use in Tray 1
[8]	Paper Size Switch (S5)	• Detects the media length in Tray 1
[9]	Tray 1 Paper Feed Clutch (CL1)	• Transmits drive from the Intermediate Transport Motor (M3) to the Tray 1 Feed Roller
[10]	Tray 1 Paper Empty Sensor (PC1)	• Detects the media level in Tray 1
[11]	Paper Lift Plate	• Surface on which the media stack is placed in Tray 1 • Maximum media capacity Plain paper: 250 sheets Thick stock, OHP film, postcards, and labels: 20 sheets Envelopes: 10 sheets

12.2 Drive

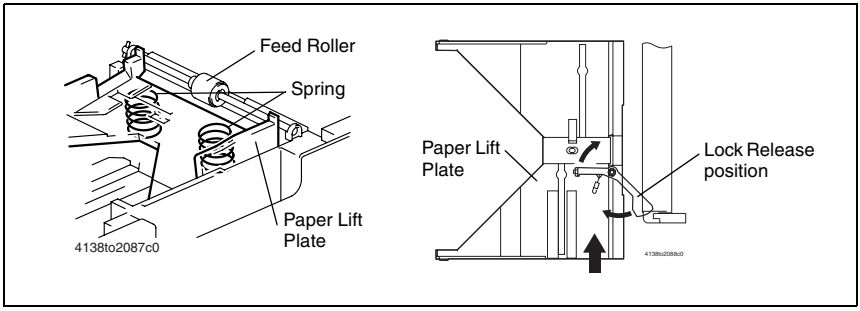


[1] Intermediate Transport Motor (M3)
[2] Tray 1 Paper Feed Clutch (CL1)
[3] Tray 1 Feed Roller

12.3 Operation

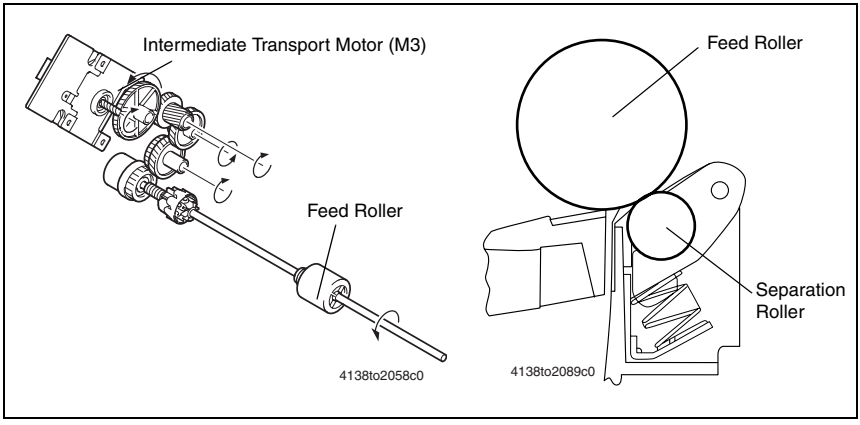
12.3.1 Paper Lift Plate mechanism

- The Paper Lift Plate is pressed down into the locked position (so the media can be loaded).
- A stack of media is loaded and then the tray is slid into the machine. This causes the Lock Release Lever to unlock the Paper Lift Plate.
- The Paper Lift Plate (media stack) is pressed against the Feed Roller.
- The Paper Lift Plate (media stack) is pressed upward by the springs at all times.



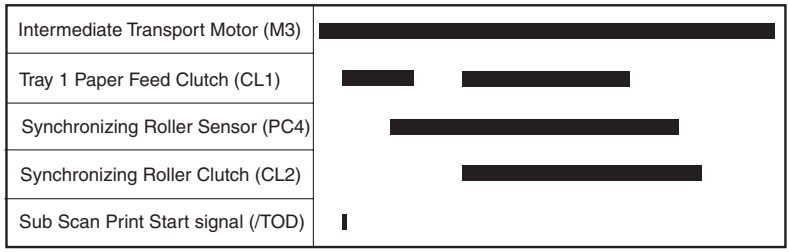
12.3.2 Media separation mechanism

- Drive from the Intermediate Transport Motor (M3) is transmitted through the Tray 1 Paper Feed Clutch (CL1) to turn the Feed Roller.
- The Feed Roller rotates to take up and feed media into the machine.
- Double-feeding of media is prevented by the Separation Roller provided with a torque limiter.



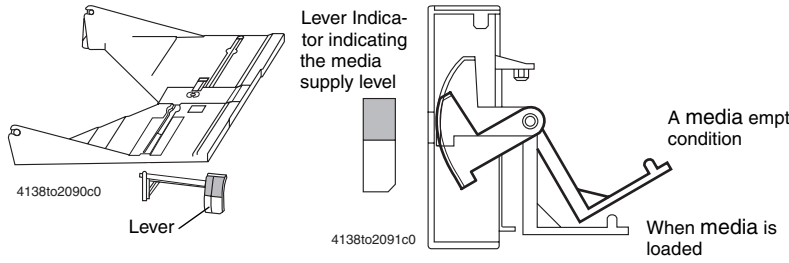
12.3.3 Media feed control

- Drive from the Intermediate Transport Motor (M3) is transmitted through the Tray 1 Paper Feed Clutch (CL1) to turn the Feed Roller, thereby taking up and feeding the media.
- The media taken up and fed in is conveyed onto the Synchronizing Roller.
- The media is pressed against the stationary Synchronizing Roller so that a loop is formed in the media. The Feed Roller is then stopped. The loop thus formed in the media corrects any mechanical skew in the media.
- The Synchronizing Roller is started [Synchronizing Roller Clutch (CL2)] in synchronism with the Sub Scan Print Start signal (/TOD) of the controller to convey the media.
- At the same time that the Synchronizing Roller is started [Synchronizing Roller Clutch (CL2)], the Feed Roller is started again so that the media is conveyed further (this is done to reduce load otherwise placed on the media feed section when the media is conveyed).
- As the trailing edge of the media reaches a point immediately before the Feed Roller, the Feed Roller is stopped.



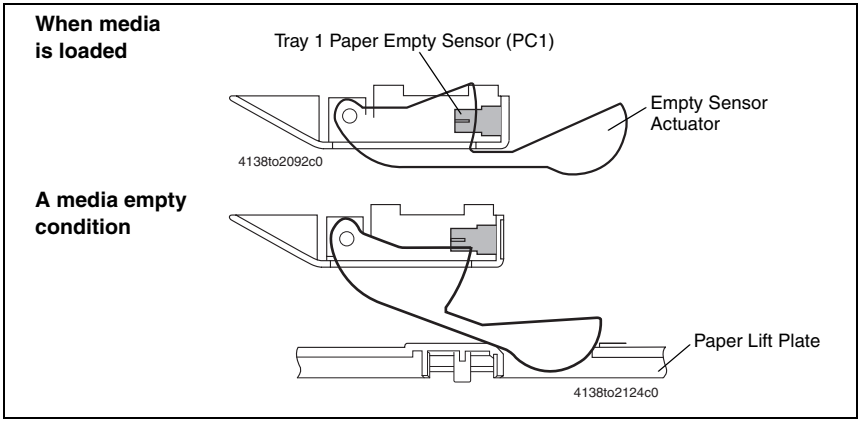
12.3.4 Media supply level detection control

- There is a window in the front cover of the cassette for indicating the media supply level.
- When the Paper Lift Plate goes up, a red lever appears in the window. The lower the level of the media stack, the more the red portion is visible.



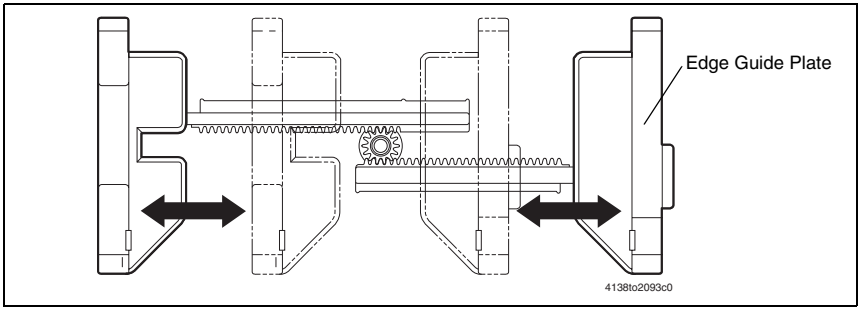
12.3.5 Media empty condition detection control

- The media empty message (TRAY1 EMPTY) is displayed on the panel when the Empty Sensor Actuator unblocks the Tray 1 Media Empty Sensor (PC1).
- No mechanism is provided for detecting a media near-empty condition. The media supply level indicator serves this purpose.



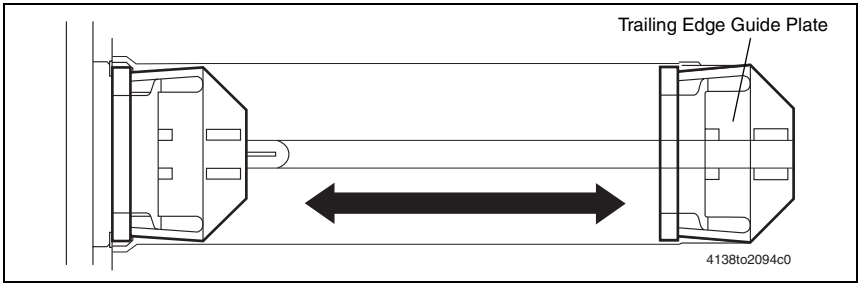
12.3.6 Edge Guide Plate

- The Edge Guide Plate can be slid to the exact size in the width direction of the media to be loaded.



12.3.7 Trailing Edge Guide Plate

- The Trailing Edge Guide Plate can be slid to the exact size in the length direction of the media to be loaded.

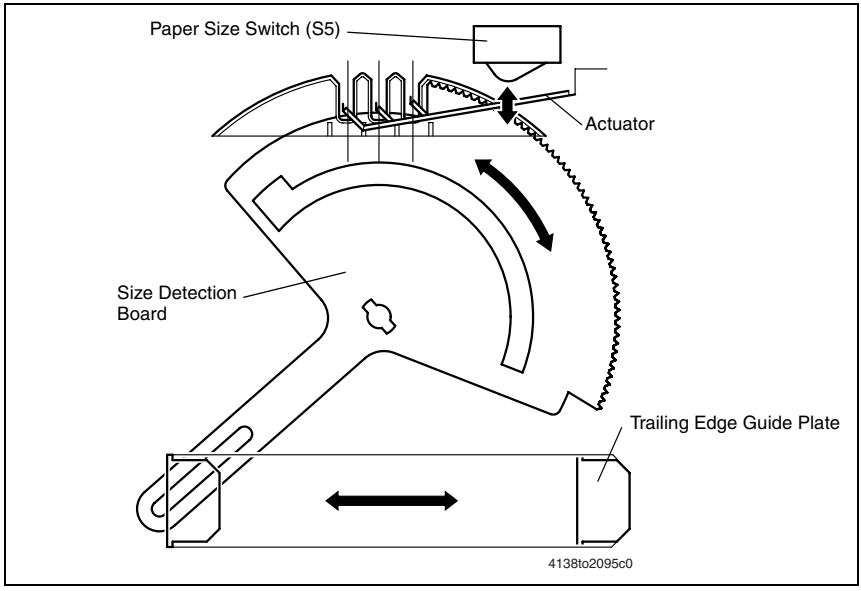


12.3.8 Media size detection control

- The Paper Size Switch (S5) detects the length size (FD) of the media.

1. The Size Detection Board turns as the Trailing Edge Guide Plate is moved.
2. When the tray is slid into the machine, the Size Detection Board pushes the actuator of the Paper Size Switch (S5) mounted to the machine frame, thus turning ON the switch.
3. The combination of ON/OFF positions of the sub-switches of the Paper Size Switch (S5) determines the specific media size that can be either one of the seven different sizes.
4. If the tray is not slid into position, all of the sub-switches are OFF and the message “TRAY1 NOT ATTACHED” appears.

Tray 1 Paper Size Switch			Media size
SW1	SW2	SW3	
ON	OFF	OFF	A4
OFF	ON	OFF	11” (Letter)
ON	OFF	ON	10” (Executive)
ON	ON	OFF	B5
OFF	ON	ON	Postcards
ON	ON	ON	Nonstandard size
OFF	OFF	OFF	Tray open



12.3.9 Media misfeed detection control

- If the Synchronizing Roller Sensor (PC4) is not activated within a predetermined period of time after a media feed sequence has been started, the machine determines that there is a media misfeed. It then gives the message “MEDIA JAM TRAY1” on the panel.
- The media misfeed display can be reset by opening and closing any of the doors.

13. Media Feed Section (magicolor 5440 DL/5450)

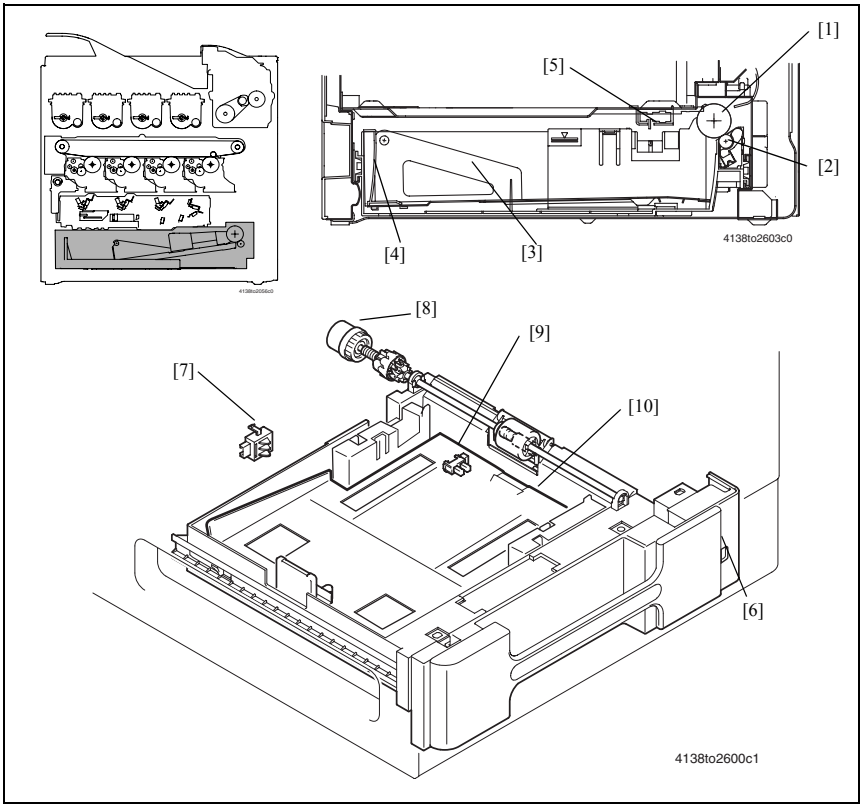
NOTE

- **Be sure to note that the feed tray located immediately under the printer is named differently depending upon the printer model.**

magicolor 5430 DL/5440 DL	TRAY1
magicolor 5450	TRAY2

- **Throughout this manual, this tray is referred to as TRAY1, its magicolor 5430 DL/ 5440 DL name.**

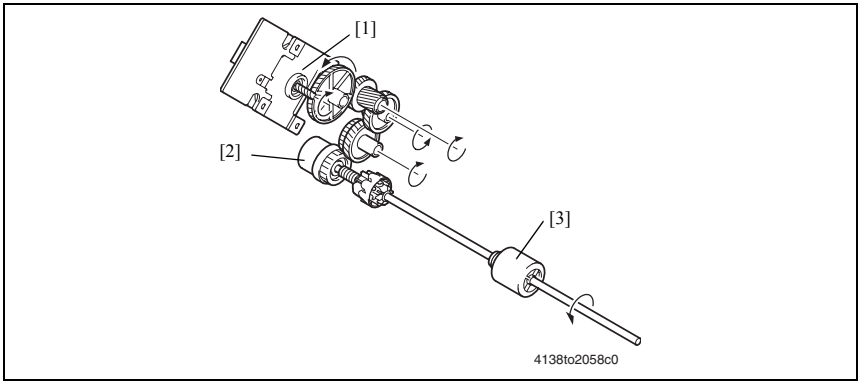
13.1 Composition



Key	Name	Function/system
[1]	Tray 1 Feed Roller	• Takes up and feeds paper from Tray 1
[2]	Tray 1 Separation Roller	• Separates paper in Tray 1 • Small-diameter roller with a torque limiter
[3]	Edge Guide Plate	• Aligns the edges of the paper stack in Tray 1
[4]	Trailing Edge Guide Plate	• Aligns the trailing edges of the paper stack in Tray 1
[5]	Empty Sensor Actuator	• Detects the length of paper in the Tray1

Key	Name	Function/system
[6]	Paper Level Indicator Lever	• Indicates the level of the paper still available for use in Tray 1
[7]	Paper Size Switch (S5)	• Detects the presence of the Tray1
[8]	Tray 1 Paper Feed Clutch (CL1)	• Transmits drive from the Intermediate Transport Motor (M3) to the Tray 1 Feed Roller
[9]	Tray 1 Paper Empty Sensor (PC1)	• Detects the paper level in Tray 1
[10]	Paper Lift Plate	• Surface on which the paper stack is placed in Tray 1 • Maximum paper capacity Plain paper: 500 sheets

13.2 Drive

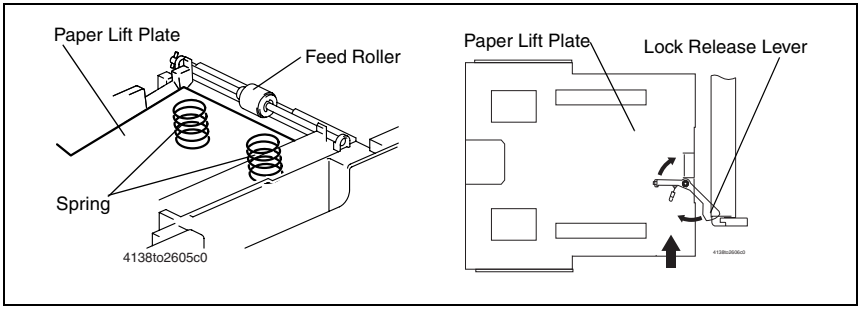


[1] Intermediate Transport Motor (M3)
[2] Tray 1 Paper Feed Clutch (CL1)
[3] Tray 1 Feed Roller

13.3 Operation

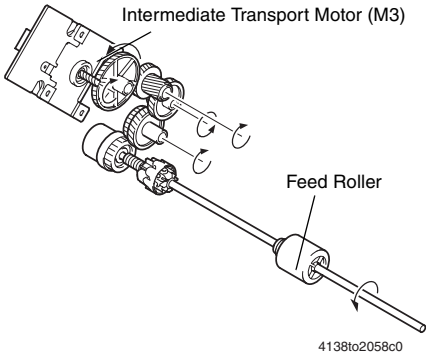
13.3.1 Paper Lift Plate mechanism

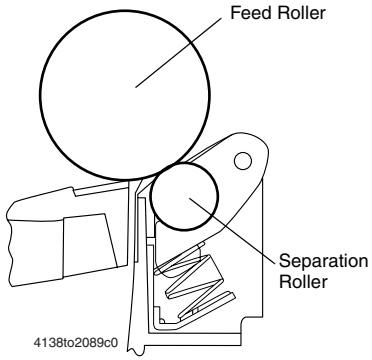
- The Paper Lift Plate is pressed down into the locked position (in which the paper is loaded in position).
- Load a paper stack and then slide the tray into the machine. This causes the Lock Release Lever to unlock the Paper Lift Plate.
- The Paper Lift Plate (paper stack) is pressed against the Feed Roller.
- The Paper Lift Plate (paper stack) is pressed upward by the springs at all times.



13.3.2 Paper separation mechanism

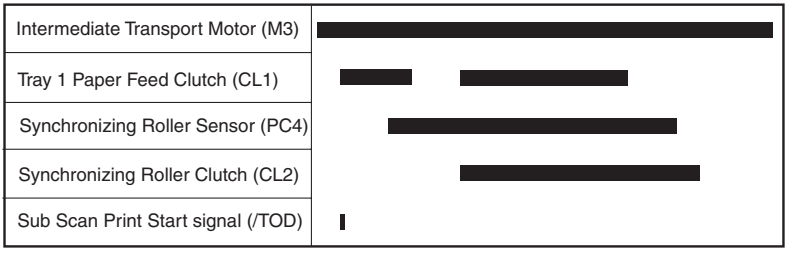
- Drive from the Intermediate Transport Motor (M3) is transmitted through the Tray 1 Paper Feed Clutch (CL1) to turn the Feed Roller.
- The Feed Roller rotates to take up and feed paper into the machine.
- Double-feeding of paper is prevented by the Separation Roller provided with a torque limiter.





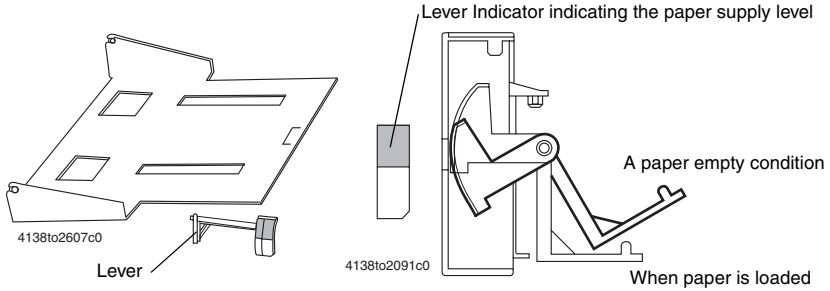
13.3.3 Paper feed control

- Drive from the Intermediate Transport Motor (M3) is transmitted through the Tray 1 Paper Feed Clutch (CL1) to turn the Feed Roller, thereby taking up and feeding the paper.
- The paper taken up and fed in is conveyed onto the Synchronizing Roller.
- The paper is pressed against the stationary Synchronizing Roller so that a loop is formed in the paper. The Feed Roller is then stopped. The loop thus formed in the paper corrects any mechanical skew in the paper.
- The Synchronizing Roller is started [Synchronizing Roller Clutch (CL2)] in synchronism with the Sub Scan Print Start signal (/TOD) of the controller to convey the paper.
- At the same time that the Synchronizing Roller is started [Synchronizing Roller Clutch (CL2)], the Feed Roller is started again so that the paper is conveyed further (this is done to reduce load otherwise placed on the paper feed section when the paper is conveyed).
- As the trailing edge of the paper reaches a point immediately before the Feed Roller, the Feed Roller is stopped.



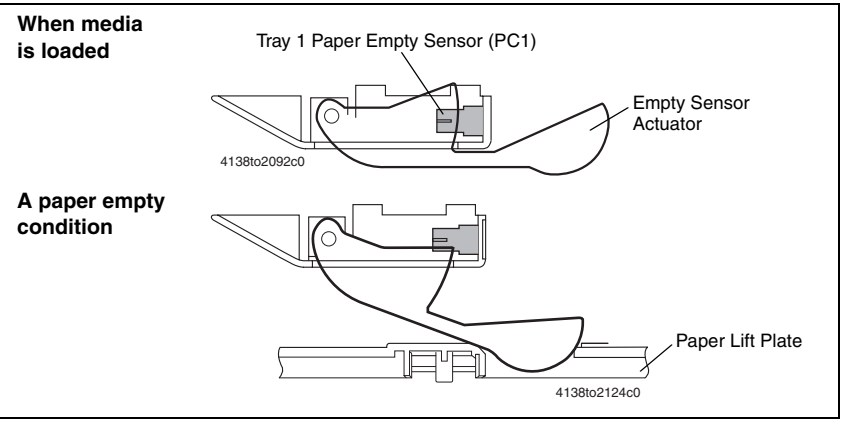
13.3.4 Paper supply level detection control

- There is a window in the front cover of the cassette for indicating the paper supply level.
- When the Paper Lift Plate goes up, a red lever appears in the window. The lower the level of the paper stack, the more the red portion is visible.



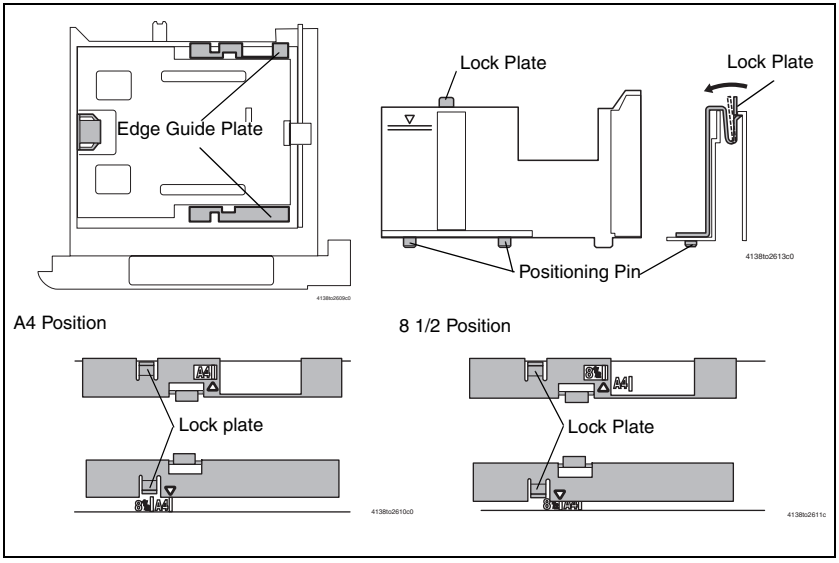
13.3.5 Paper empty condition detection control

- The paper empty message “TRAY1 EMPTY (magicolor 5440)” or “PAPER EMPTY TRAY2 (magicolor 5450)” is displayed on the panel when the Empty Sensor Actuator unblocks the Tray 1 Paper Empty Sensor (PC1).
- No mechanism is provided for detecting a paper near-empty condition. The paper supply level indicator serves this purpose.



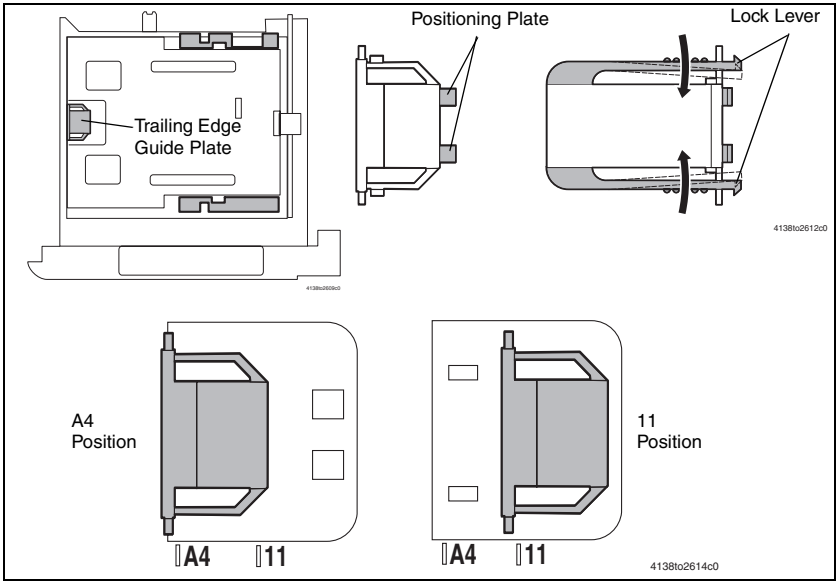
13.3.6 Edge Guide Plate

- Set the appropriate Edge Guide Plate which corresponds to the width of the media to be loaded (A4 or 81/2).
- No mechanism is provided for detecting the media size.



13.3.7 Trailing Edge Guide Plate

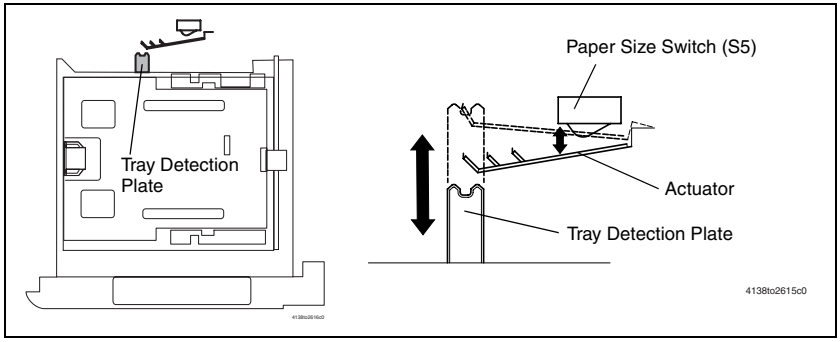
- Set the appropriate Trailing Edge Plate which corresponds to the length of the media (A4 or 11). The size detection function is not equipped.
- No mechanism is provided for detecting the media size.



13.3.8 Tray detection control

- Detects the Tray presence with the Paper size switch (S5).

1. Setting the Tray to the printer will make the detecting plate press and turn ON the actuator for the Paper size switch (S5) mounted on the Copier frame.
2. The switch will be OFF if the Tray is not properly set, and “TRAY1 DRAWER OPEN (magicolor 5440 DL)” or “PAPER EMPTY TRAY2 (magicolor 5450)” will be displayed.



13.3.9 Media misfeed detection control

- If the Synchronizing Roller Sensor (PC4) is not activated within a predetermined period of time after a paper feed sequence has been started, the machine determines that there is a media misfeed. It then gives the message “MEDIA JAM TRAY1 (magicolor 5440 DL)” or “PAPER JAM TRAY2 (magicolor 5450)” on the panel.
- The media misfeed display can be reset by opening and closing any of the doors.

14. Manual Feed Section (magicolor 5440 DL/5450)

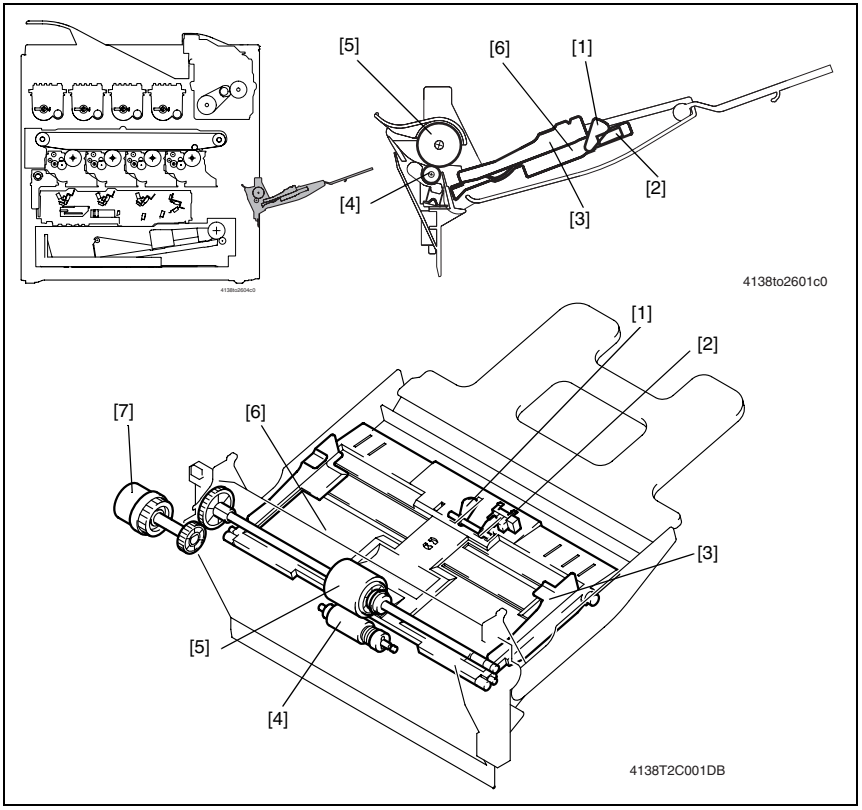
NOTE

- **Be sure to note that the feed tray located on the right side of the printer is named differently depending upon the printer model.**

magicolor 5430 DL/5440 DL	MANUAL FEED TRAY
magicolor 5450	TRAY1

- **Throughout this manual, this tray is referred to as MANUAL FEED TRAY, its magicolor 5430 DL/5440 DL name.**

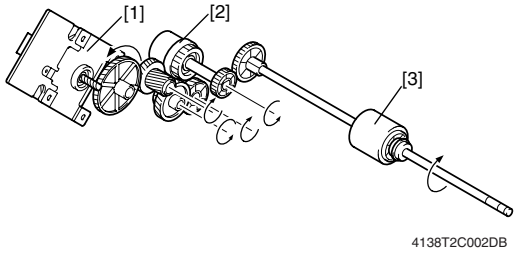
14.1 Composition



Key	Name	Function/system
[1]	Empty Sensor Actuator	• Detects the media level in Manual Feed Tray
[2]	Manual Feed Tray Paper Empty Sensor (PC3)	• Detects the media level in Manual Feed Tray
[3]	Edge Guide Plate	• Aligns the edges of the media stack in Manual Feed Tray

Key	Name	Function/system
[4]	Manual Feed Tray Separation Roller	• Separates media in Manual Feed Tray • Small-diameter roller with a torque limiter
[5]	Manual Feed Tray Feed Roller	• Takes up and feeds media from Manual Feed Tray
[6]	Paper Lift Plate	• Surface on which the media stack is placed in Manual Feed Tray • Maximum paper capacity Plain paper: 100 sheets Thick stock, OHP film, postcards, and labels: 20 sheets Envelopes: 10 sheets
[7]	Manual Feed Tray Paper Feed Clutch (CL3)	• Transmits drive from the Intermediate Transport Motor (M3) to the Manual Feed Tray Feed Roller.

14.2 Drive

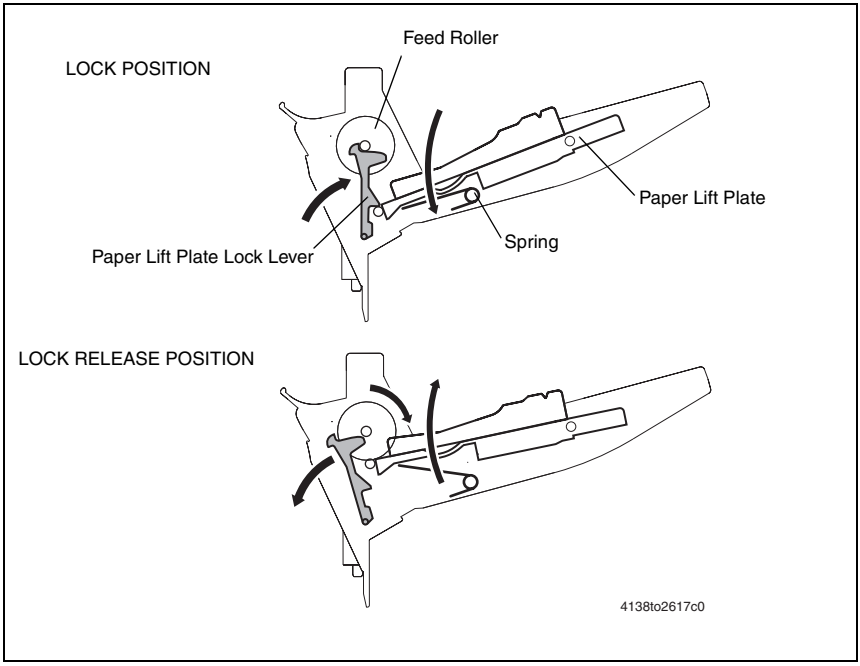


[1] Intermediate Transport Motor (M3)
[2] Manual Feed Tray Paper Feed Clutch (CL3)
[3] Manual Feed Tray Feed Roller

14.3 Operation

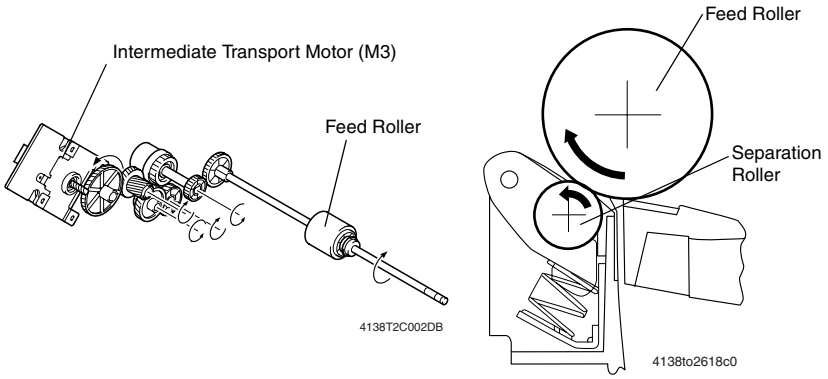
14.3.1 Paper Lift Plate mechanism

- The Paper Lift Plate will be locked under the Paper Lift Plate Lock Lever by pressing it down (in which the media is loaded in position). The Paper Lift Plate Lock Lever will be pressed to the Feed Roller.
- The Paper Feed Clutch will rotate the Feed Roller to activate the Lock Release Lever pressed to the Feed Roller, and the Paper Lift Plate will be unlocked.
- The Paper Lift Plate (media stack) is pressed against the Feed Roller.
- The Paper Lift Plate (media stack) is pressed upward by the springs at all times.



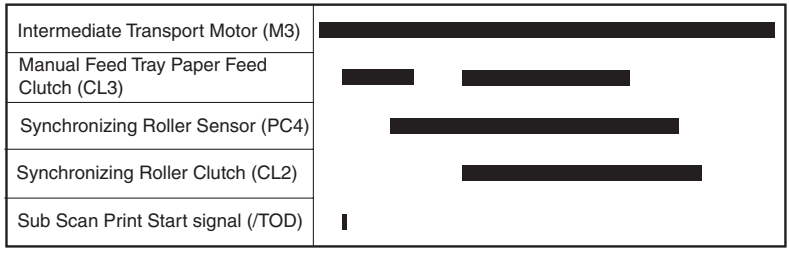
14.3.2 Media separation mechanism

- Drive from the Intermediate Transport Motor (M3) is transmitted through the Manual Feed Tray Paper Feed Clutch (CL3) to turn the Feed Roller.
- The Feed Roller rotates to take up and feed media into the machine.
- Double-feeding of media is prevented by the Separation Roller provided with a torque limiter.



14.3.3 Media feed control

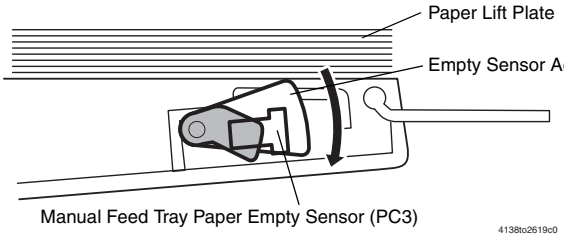
- Drive from the Intermediate Transport Motor (M3) is transmitted through the Manual Feed Tray Paper Feed Clutch (CL3) to turn the Feed Roller, thereby taking up and feeding the media.
- The media taken up and fed in is conveyed onto the Synchronizing Roller.
- The media is pressed against the stationary Synchronizing Roller so that a loop is formed in the media. The Feed Roller is then stopped. The loop thus formed in the media corrects any mechanical skew in the media.
- The Synchronizing Roller is started [Synchronizing Roller Clutch (CL2)] in synchronism with the Sub Scan Print Start signal (/TOD) of the controller to convey the media.
- At the same time that the Synchronizing Roller is started [Synchronizing Roller Clutch (CL2)], the Feed Roller is started again so that the media is conveyed further (this is done to reduce load otherwise placed on the media feed section when the media is conveyed).
- As the trailing edge of the media reaches a point immediately before the Feed Roller, the Feed Roller is stopped.



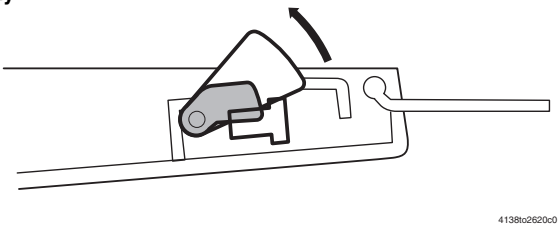
14.3.4 Media empty condition detection control

- A media empty condition is detected when the Empty Sensor Actuator unblocks the Manual Feed Tray Paper Empty Sensor (PC3).
- No mechanism is provided for detecting a media near-empty condition. The media supply level indicator serves this purpose.

When media is loaded

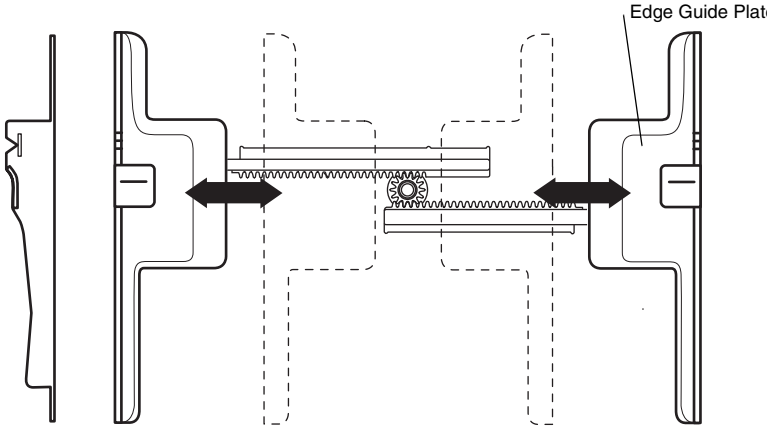


A media empty condition



14.3.5 Edge Guide Plate

- The Edge Guide Plate can be slid to the exact size in the width direction of the media to be loaded.
- No mechanism is provided for detecting a media size.

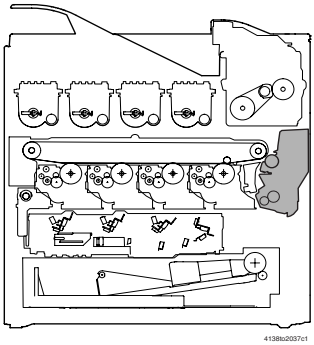


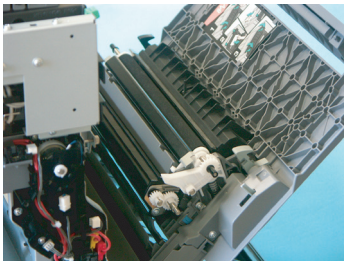
14.3.6 Media misfeed detection control

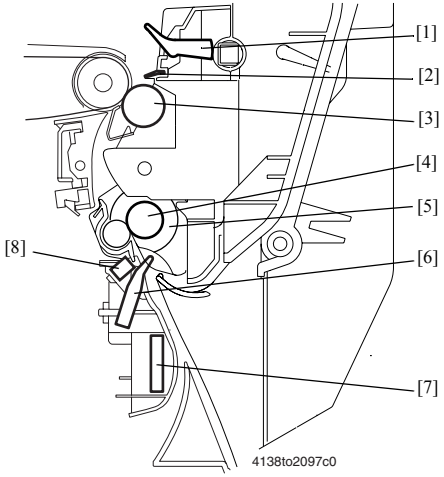
- If the Synchronizing Roller Sensor (PC4) is not activated within a predetermined period of time after a media feed sequence has been started, the machine determines that there is a media misfeed. It then gives the message “MEDIA JAM MANUAL FEED TRAY (magicolor 5440 DL)” or “PAPER JAM TRAY1 (magicolor 5450)” on the panel.
- The media misfeed display can be reset by opening and closing any of the doors.

15. Conveyance Section

15.1 Composition



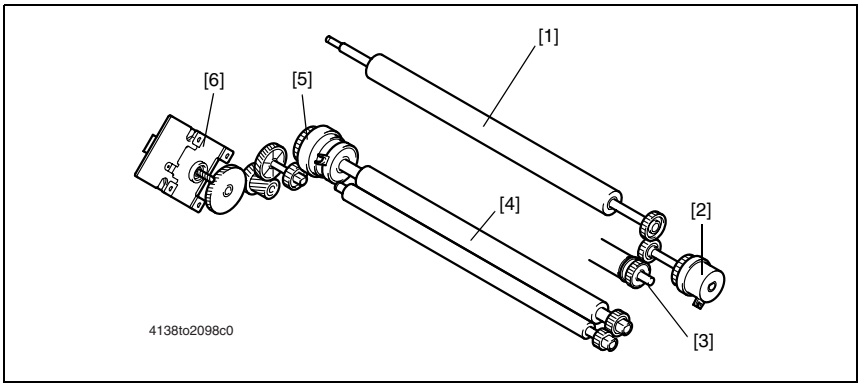




Key	Name	Function/system
[1]	Paper Loop Sensor (PC6)	• Detects the length of the loop in the media conveyed from the 2nd Transfer Roller
[2]	Charge Neutralizing Cloth	• Neutralizes the media that has undergone the 2nd transfer process
[3]	2nd Transfer Roller	• Transfers the images in four colors of toner on the Transfer Belt to the media
[4]	Synchronizing Roller	• Conveys the media fed from the Feed Roller to the transfer section • Synchronizes the media fed from the Feed Roller with the image • Corrects any skew in the media fed from the Feed Roller
[5]	Synchronizing Roller Clutch (CL2)	• Transmits the drive from the Intermediate Transport Motor (M3) to the Synchronizing Roller

Key	Name	Function/system
[6]	Synchronizing Roller Sensor (PC4)	• Detects the leading edge of the media fed from the Feed Roller
[7]	Temperature/humidity Sensor (HS1)	• Detects temperature and humidity inside the machine
[8]	OHP Sensor (PC7)	• Identifies the type of the media fed from the Feed Roller

15.2 Drive



[1] 2nd Transfer Roller
[2] Pressure/Retraction Clutch/2nd Image Transfer (CL5)
[3] Transfer Belt Driver Roller
[4] Synchronizing Roller
[5] Synchronizing Roller Clutch (CL2)
[6] Intermediate Transport Motor (M3)

15.3 Operation

15.3.1 Conveyance speed control

- The Intermediate Transport Motor (M3) provides drive for the conveyance section.
- The conveyance speed is variable in three steps and the appropriate one is selected according to the media type and print mode as detailed below.

Media type/print mode	Conveyance speed	Reason
Plain paper	1 (standard)	
Thick stock, envelopes, postcards, label OHP film (monochrome print)	1/2 (one-half speed)	To ensure good fusing performance
OHP film (color print)	1/3 (one-third speed)	To ensure good light transmission performance

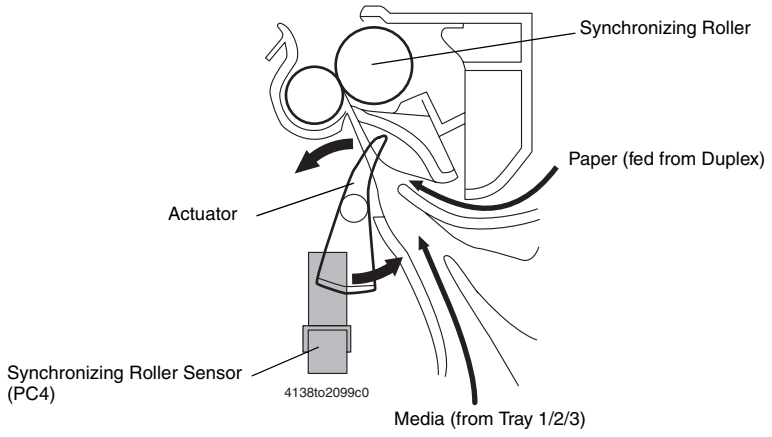
- For the first print, the machine makes the above decision before starting a print/media feed sequence and, based on the established speed, starts the print/media feed sequence.

15.3.2 Synchronizing Roller control

- When the media taken up and fed in by the Feed Roller reaches the Synchronizing Roller, a loop is formed in the media and media conveyance is temporarily stopped. Conveyance skew is corrected by this loop.
- The Synchronizing Roller Sensor (PC4) detects whether or not the media has reached the Synchronizing Roller.
- The media fed in is synchronized with the image before media conveyance is restarted.

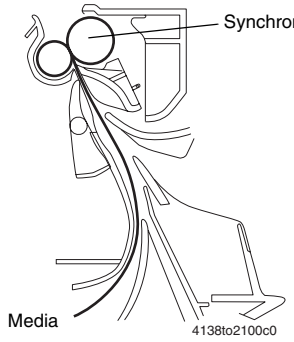
A. Media detection control

- When the media fed from the Feed Roller pushes up the actuator of the Synchronizing Roller Sensor (PC4), the sensor is unblocked. With this event occurring, the machine determines that the media has reached the position before the Synchronizing Roller.



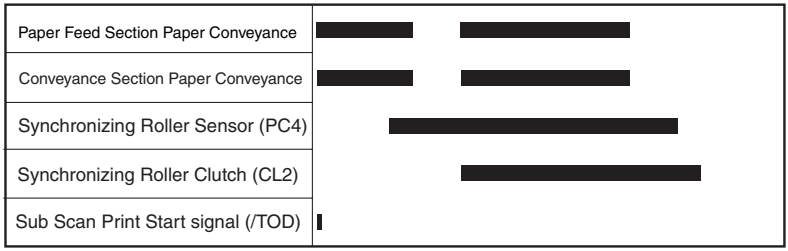
15.3.3 Control of loop formed before Synchronizing Roller

- Media conveyance is stopped after the lapse of a predetermined period of time after the leading edge of the media fed from the Feed Roller has reached the Synchronizing Roller. This forms a loop in the media.
- The loop in the media corrects skew in the media.



A. Media conveyance temporary stop control

- <Media conveyance stop>
 A given period of time after the Synchronizing Roller Sensor (PC4) has detected the leading edge of the media, media conveyance in the media feed/conveyance section is stopped.
- <Restart>
 Media conveyance in the media feed/conveyance section is restarted in synchronism with the Sub Scan Print Start signal (/TOD) of the controller.



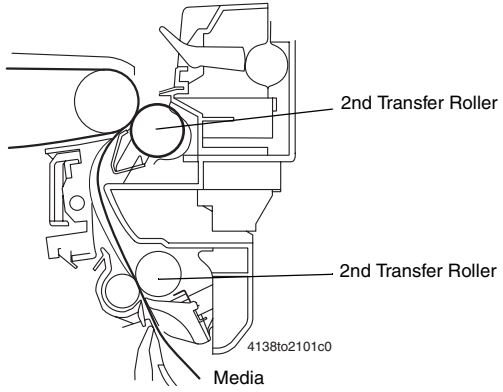
B. Synchronizing Roller Clutch (CL2) control

- In synchronization with the leading edge of the image [the Sub Scan Print Start signal (/TOD) of the controller] after the leading edge of the media has reached the Synchronizing Roller and a loop has been formed in the media, the Synchronizing Roller Clutch (CL2) is energized to start turning the Synchronizing Roller.
- After the lapse of a predetermined period of time after the Synchronizing Roller Sensor (PC4) has been deactivated by the media, the Synchronizing Roller Clutch (CL2) is de-energized to stop the Synchronizing Roller.



15.3.4 Control of loop formed before 2nd transfer

- A loop is formed in the media by the difference between the 2nd Transfer Roller media conveyance speed (1.000) and the Synchronizing Roller media conveyance speed (1.006).
- The loop formed in the media absorbs effect from the Synchronizing Roller side, thus preventing it from being transferred to the 2nd transfer section.

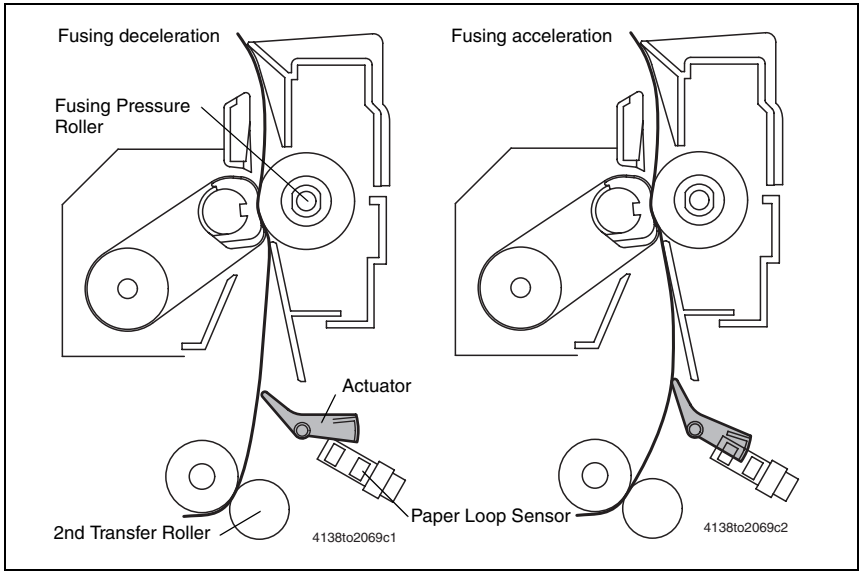


15.3.5 Control of loop formed before fusing section

- The difference between the fusing speed and media conveyance speed is corrected to prevent double transferred images and brush effects from occurring.
- The Paper Loop Sensor (PC6) detects the length of the loop formed in the media between the 2nd Transfer Roller and the Fusing Pressure Roller. The fusing speed is then varied according to the length of the loop detected. By varying the fusing speed, any effects from the Fusing Pressure Roller side (part-to-part variations, change of parts over time) are prevented from being transferred to the 2nd transfer section.
- No loop control is provided to perform the fusing process at high speeds when envelopes are used (to prevent wrinkles).

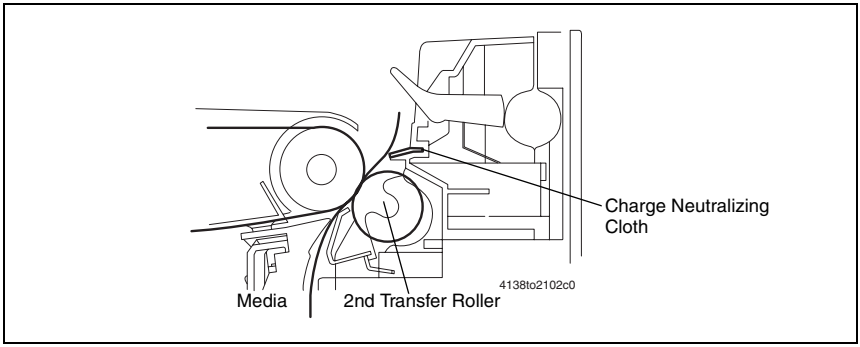
☞ 2-100

- Fusing deceleration (low speed):
 When the media loop length is small, the actuator of the Paper Loop Sensor (PC6) is pushed up a small amount and the sensor is unblocked. When the sensor is unblocked, the fusing speed is decelerated (-1.36%).
- Fusing acceleration (high speed):
 When the media loop length is large, the actuator of the Paper Loop Sensor (PC6) is pushed up a large amount and the sensor is blocked. When the sensor is blocked, the fusing speed is accelerated (+1.64%).



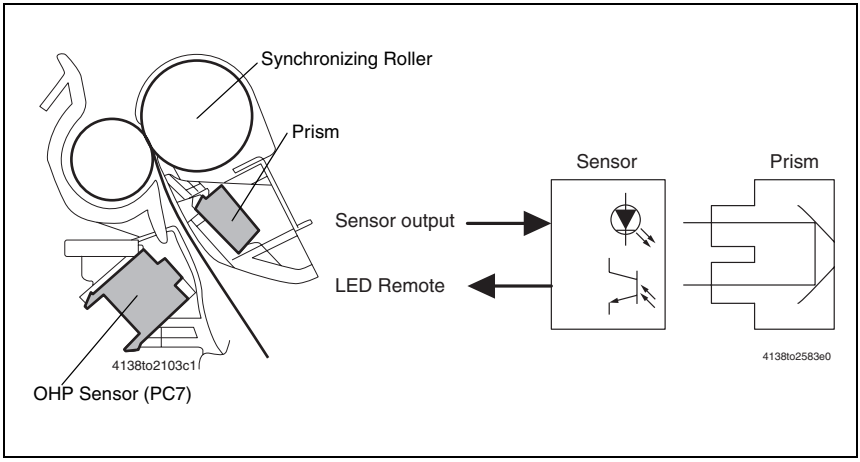
15.3.6 Media neutralization

- The Charge Neutralizing Cloth neutralizes any charge left in the media after the 2nd transfer process.
- The charge residue is grounded through the Charge Neutralizing Cloth to the machine frame.



15.3.7 OHP film detection control

- To prevent incorrect prints on OHP film, the type of the media being conveyed is detected by the OHP Sensor (PC7).
- The OHP detection is made after the loop has been formed in the media before the Synchronizing Roller.
- If the output voltage of the OHP Sensor (PC7) is less than a predetermined value, the machine considers that the media is a type other than OHP film. If the output voltage is the predetermined value or more, the machine determines that the media is OHP film.



- If the media type setting does not match the results of OHP detection, the machine suspends the print cycle and displays the message “SIZE/TYPE ERROR (magicolor 5430 DL/5440 DL)” or “PAPER ERROR (magicolor 5450)” on the panel.
- The media that has caused type error is fed out of the machine after going through the 2nd transfer and fusing processes. The subsequent sheets of media are subjected to the following operation.

Media state			Feed operation	Print operation	Exit operation
Media	Print	Feed			
"TYPE ERROR" media			Feed	Print	Exit
Subsequent sheets	Yet to be printed	Yet to be fed	Suspend	Suspend	Suspend
	Printed		Feed	Print	Exit
	Yet to be printed	Fed	Feed	Print	Exit
	Printed		Feed	Print	Exit

15.3.8 Media size error detection control

- To prevent incorrect printed pages, the size of the media being conveyed is detected using the Synchronizing Roller Sensor (PC4) and Lower Feeder Paper Feed Sensor (PC3 PF: option).
- The length of the media is detected based on the value calculated using the period of time that begins when the sensor is activated and ends when it is deactivated for each media source.
- For the Lower Feeder Unit, even if the Lower Feeder Paper Feed Sensor (PC3 PF) does not detect a media size error, the downstream Synchronizing Roller Sensor (PC4) makes an error check again.

Media source	Media length detection sensor	Starting point	Ending point
Tray 1	Synchronizing Roller Sensor (PC4)	Synchronizing Roller Clutch (CL2) energized	PC4 deactivated
Lower Feeder Unit (Tray 2)	Lower Feeder Paper Feed Sensor (PC3 PF: Tray 2)	PC3 PF activated	PC3 PF deactivated
	Synchronizing Roller Sensor (PC4)	CL2 energized	PC4 deactivated
Lower Feeder Unit (Tray 3)	Lower Feeder Paper Feed Sensor (PC3 PF: Tray 3)	PC3 PF activated	PC3 PF deactivated
	Lower Feeder Paper Feed Sensor (PC3 PF: Tray 2)	PC3 PF activated	PC3 PF deactivated
	Synchronizing Roller Sensor (PC4)	CL2 energized	PC4 deactivated
Duplex Unit	No media length is detected.		

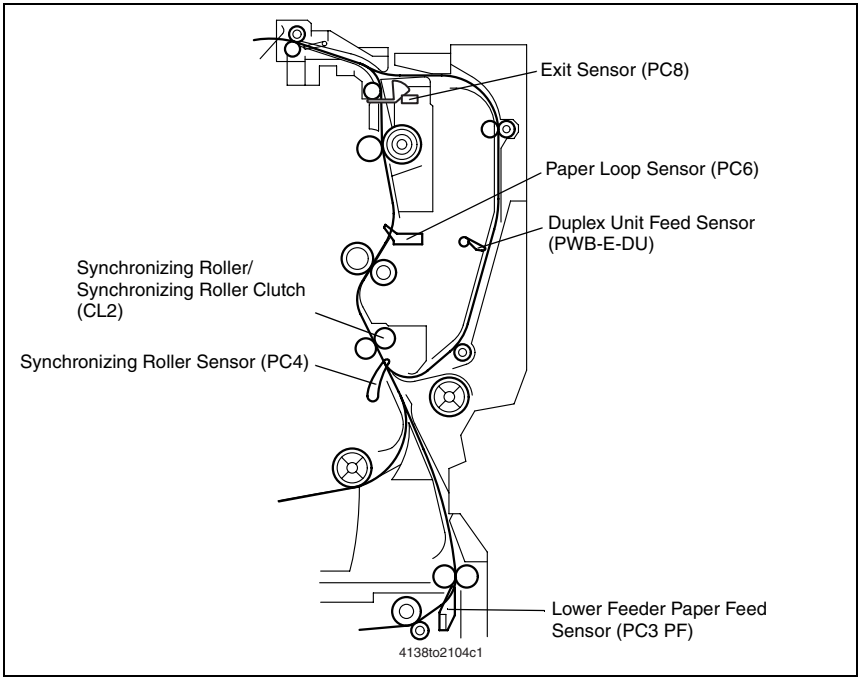
- If there is a mismatch between the media size setting and the results of media size detection, the machine suspends the print cycle and displays the message "SIZE/TYPE ERROR (magicolor 5430 DL/5440 DL)" or "PAPER ERROR (magicolor 5450)" on the panel.
- The media that has caused size error is fed out of the machine after going through the 2nd transfer and fusing processes.
- The subsequent sheets of media are subjected to the following operation.

Media state			Feed operation	Print operation	Exit operation
Media	Print	Feed			
Size error media			Feed	Print	Exit
Subsequent sheets	Yet to be printed	Yet to be fed	Suspend	Suspend	Suspend
	Printed		Feed	Print	Exit
	Yet to be printed	Fed	Feed	Print	Exit
	Printed		Feed	Print	Exit

- The size error display can be reset when the Power Switch is turned OFF and ON, or by a reset command (media size error reset).
- If a media size error is detected during 2-sided printing, the machine determines that there is a media misfeed and stops operating.

15.3.9 Conveyance system media misfeed detection control

- A specific sensor is assigned for each section of the conveyance system to detect a media misfeed that could occur along the path.
- When a media misfeed is detected, the machine suspends the print cycle and gives the message “MEDIA JAM (magicolor 5430 DL/5440 DL)” or “PAPER JAM (magicolor 5450)” on the panel. The machine thereafter attempts to detect any sheet of media left inside it.



Misfeed type	Misfeed detection starting point	Misfeed detection condition
Misfeed at vertical conveyance section	Lower Feeder Paper Feed Sensor (PC3 PF: Tray 2) activated	PC4 not activated
		PC3 PF: Tray 2 not deactivated
	Lower Feeder Paper Feed Sensor (PC3 PF: Tray 3) activated	PC4 not activated
		PC3 PF: Tray 3 not deactivated
Misfeed at 2nd transfer section	Synchronizing Roller Sensor (PC4) activated	PC4 not deactivated
		PC8 not activated
	Synchronizing Roller Clutch (CL2) activated	PC4 not deactivated
Misfeed at exit/fusing section	Exit Sensor (PC8) activated	PC8 not deactivated
	Exit Sensor (PC8) deactivated	PWB-E-DU not activated
Misfeed at Duplex Unit	Duplex Unit Feed Sensor activated	PC4 not activated
		PWB-E-DU not deactivated

- The “MEDIA JAM (magicolor 5430 DL/5440 DL)” or “PAPER JAM (magicolor 5450)” display is reset when all doors are closed after any of the doors has been open. At the same time, the information on media left is cleared. Thereafter, the machine attempts to detect any sheet of media left inside it again.

15.3.10 Control of detection of media left in conveyance system

- Any sheet of media left inside the machine is checked when the Power Switch is turned ON or a door is opened and closed.

A. Sensor activation detection

- The machine checks sensors sequentially and, if a sensor is found to be activated, determines that there is a sheet of media left there inside the machine. Then, the machine gives the message of “MEDIA JAM (magicolor 5430 DL/5440 DL)” or “PAPER JAM (magicolor 5450)” on the panel.
- If all sensors are found to be deactivated, the machine proceeds to the step of “detection of media left between sensors along 1-sided conveyance path.”

B. Detection of media left between sensors along 1-sided conveyance path

- The Paper Exit Roller, Fusing Pressure Roller, and Synchronizing Roller are turned in the direction of feeding media out of the machine.
- If the Exit Sensor (PC8) is activated, the machine determines that there is a sheet of media left and gives the message “MEDIA JAM TRANSFER ROLLER (magicolor 5430 DL/5440 DL)” or “PAPER JAM VERTICAL TRANS (magicolor 5450)” on the panel.

C. Detection of media left between sensors along 2-sided conveyance path

- If the machine detects that the Duplex Unit Feed Sensor on the Duplex Board (PWB-E DU) is activated, it determines that there is a sheet of media left and gives the message “MEDIA JAM DUPLEX UPPER (magicolor 5430 DL/5440 DL)” or “PAPER JAM DUPLEX1 (magicolor 5450)” on the panel.
- If the machine detects that the Synchronizing Roller Sensor (PC4) is activated, it determines that there is a sheet of media left and gives the message “MEDIA JAM DUPLEX LOWER (magicolor 5430 DL/5440 DL)” or “PAPER JAM DUPLEX2 (magicolor 5450)” on the panel.

15.3.11 Control of detection of media left in machine upon stoppage of media conveyance

- When media conveyance is stopped due to a media misfeed, a malfunction, an opened door, or a unit closure failure, the machine checks for media left inside it.
- If a media misfeed occurs, the machine performs the following detection procedures 1 to 3.
- If there is a malfunction, an open door, or a unit closure failure, the machine carries out the detection procedures 2 and 3.

1. The machine sets the remaining media information according to the cause of the media misfeed as it occurs.

Cause of media misfeed	Remaining media information
Misfeed at vertical conveyance section	Media left at vertical conveyance section
Misfeed at Tray 1 media feed section	Media left at Tray 1 media feed section
Misfeed at Tray 2 media feed section	Media left at Tray 2 media feed section
Misfeed at Tray 3 media feed section	Media left at Tray 3 media feed section
Misfeed in Duplex Unit media feed section	Media left in Duplex Unit media feed section
Misfeed in 2-sided conveyance section	Media left in Duplex conveyance section
Misfeed at 2nd transfer section	Media left at 2nd transfer section
	Media left at Tray 2 media feed section (when media is fed from Tray 2)
Misfeed at exit/fusing section	Media left at exit/fusing section

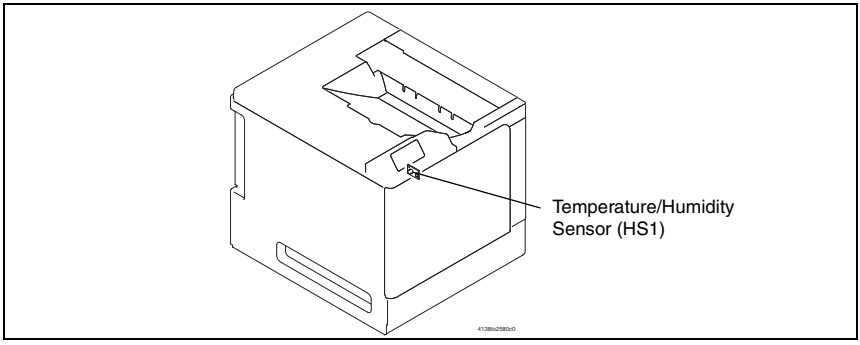
2. If media information is left inside the Mechanical Control Board when a media misfeed, a malfunction, or a unit closure failure occurs or a door is opened, the machine detects the media that is left inside it based on the actual media location and other data available from the media information. If the machine determines that there is media left, it gives the “MEDIA JAM” or “PAPER JAM” message corresponding to the location of the media left.

3. The machine detects media left using sensors (by performing the same control as in the control of detection of media left).

15.3.12 Temperature/humidity Sensor

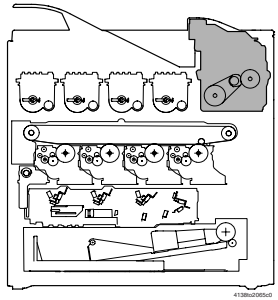
- The Temperature/humidity Sensor detects temperature and humidity inside the machine.
- The detected data are used for image stabilization control, ATVC control, and transfer output control.

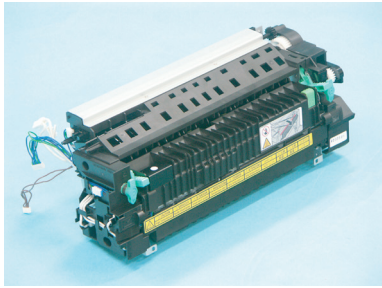
☞ 2-118, 2-40, 2-52



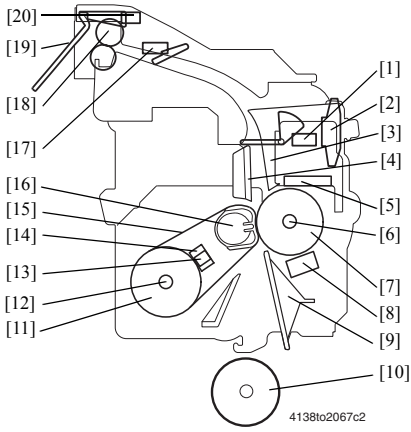
16. Fusing Section

16.1 Composition





4138to2066c0

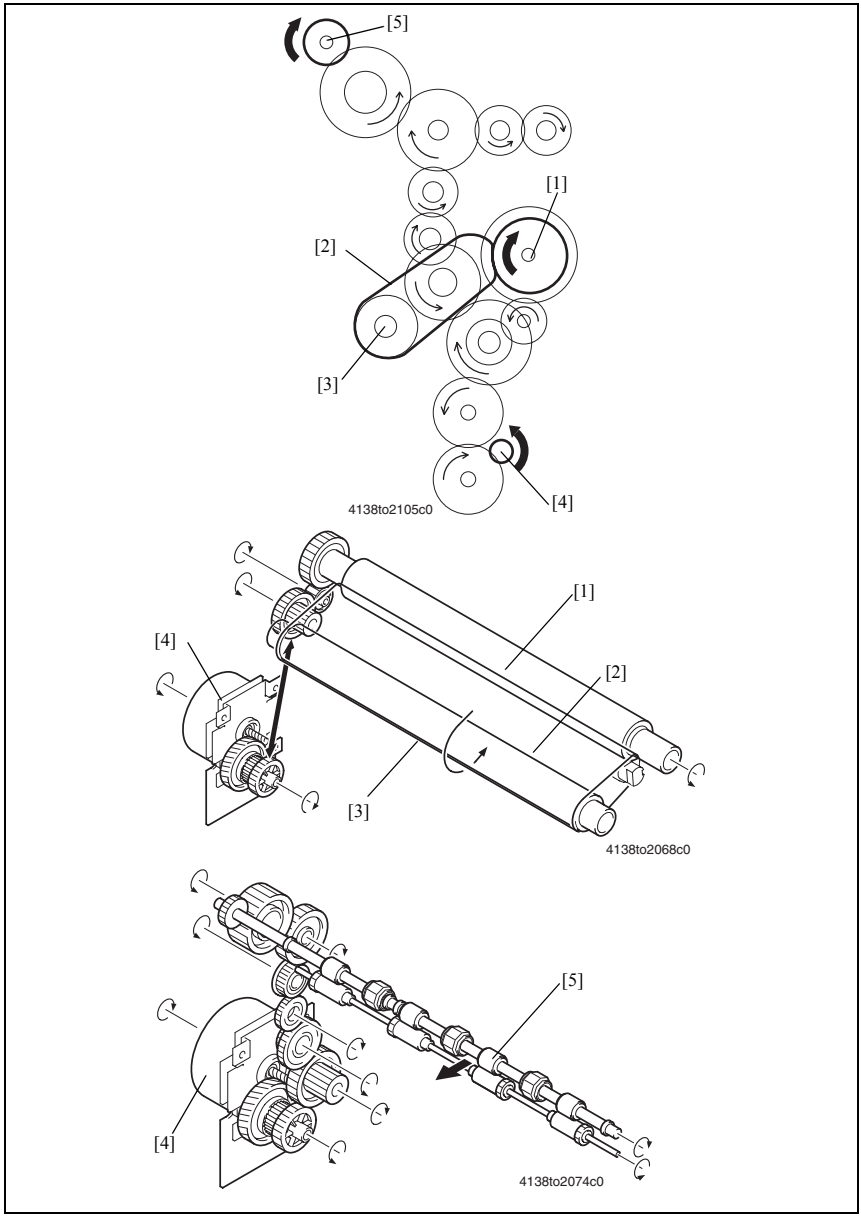


4138to2067c2

Key	Name	Function/system
[1]	Exit Sensor (PC8)	• Detects the media conveyed from the Fusing Pressure Roller and Fusing Belt
[2]	Fusing Pressure Roller Pressure Selector Dial	• Used to select the pressure of the Fusing Pressure Roller in two steps (normal mode and envelope mode)
[3]	Upper Paper Separator Claw	• Separates the media from the roller • Prevent the media from winding around the roller
[4]	Lower Paper Separator Claw	
[5]	Fusing Pressure Roller Thermistor (TH2)	• Controls the temperature of the Fusing Pressure Roller • Non-contact type
[6]	Fusing Pressure Roller Heater Lamp (H2)	• Heats the Fusing Pressure Roller • Prevents the surface temperature of the Fusing Belt from being decreased • Heater lamp: 300 W

Key	Name	Function/system
[7]	Fusing Pressure Roller	• Applies pressure to the toner to fuse it into the media • Toner is fused by the Fusing Pressure Roller and Fusing Belt
[8]	Fusing Pressure Roller Thermostat (TS2)	• Detects an abnormally high temperature of the Fusing Pressure Roller • Non-contact type
[9]	Fusing Entrance Guide Plate	• Guides the media between the Heating Roller and Fusing Pressure Roller
[10]	Fusing Motor (M4)	• Drives the Fusing Pressure Roller and Paper Exit Roller
[11]	Heating Roller	• Heated to a required temperature by the heater lamp provided inside this roller • Supplies the Fusing Belt with heat
[12]	Heating Roller Heater Lamp (H1)	• Heats the Heating Roller • Heater lamp: 700 W
[13]	Heating Roller Thermistor (TH1)	• Controls the temperature of the Heating Roller • Type in contact with the roller
[14]	Heating Roller Thermostat (TS1)	• Detects an abnormally high temperature of the Heating Roller • Type in contact with the roller
[15]	Fusing Belt	• Applies heat to the toner to fuse it into the media • Toner is fused by the Fusing Pressure Roller and Fusing Belt
[16]	Fusing Pad	• Presses the Fusing Belt against the Fusing Pressure Roller
[17]	Paper Size Sensor (PC23)	• Detects the size of the media conveyed from the Fusing Pressure Roller and Fusing Belt
[18]	Paper Exit Roller	• Feeds the media conveyed from the Fusing Pressure Roller and Fusing Belt out into the Exit Tray
[19]	Paper Holding Plate	• Guides the media fed out of the machine into the Exit Tray • Prevents the trailing edge of the media from failing to clear the Exit Roller • It also serves as the actuator of the Paper Full Sensor (magicolor 5450 only)
[20]	Paper Full Sensor (PC20)	• Detects load capacity full of the media fed to the print tray (magicolor 5450 only)

16.2 Drive

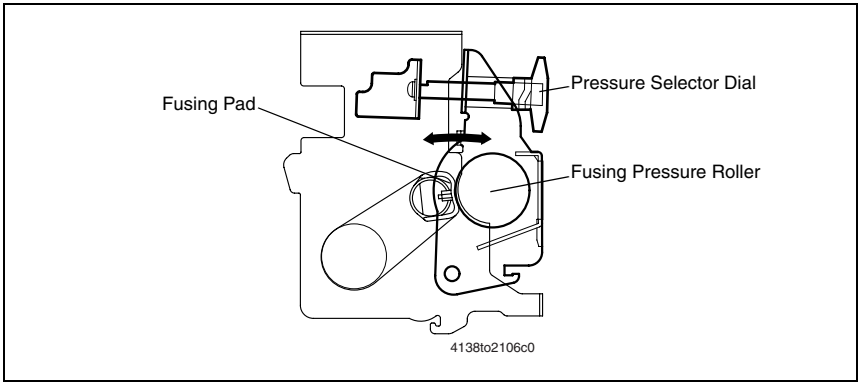


[1] Fusing Pressure Roller
[2] Fusing Belt
[3] Heating Roller
[4] Fusing Motor (M4)
[5] Paper Exit Roller

16.3 Operation

16.3.1 Fusing Pressure Roller pressure selection mechanism

- The pressure applied by the Fusing Pressure Roller is selected appropriately to prevent media wrinkles during printing of envelopes.
- A pressure selection mechanism is provided to vary the pressure in two steps.
- The pressure is selected by placing the Pressure Selector Dial in either of the two positions that are 180 degrees apart from each other.
- Placing the dial in the appropriate position selects the corresponding pressure applied by the Fusing Pressure Roller to the Fusing Pad.
- Place the dial in the top position when printing is to be done on plain paper or a similar type of media (for a high pressure).
- Place the dial in the bottom position when printing is to be done on envelopes (for a low pressure).
- Whenever printing on envelopes, the Pressure Selector Dial must be placed in the appropriate position. When the print cycle using envelopes is completed, be sure to place the dial back in the original position.
- If the print cycle is started without first selecting the appropriate position of the dial, envelopes are very likely to be wrinkled, and the image could be poorly fused on plain paper and similar media.



16.3.2 Fusing Pressure Roller drive control

A. Fusing speed selection control

- The Fusing Motor (M4) provides drive for the fusing section.
- The appropriate fusing speed is selected from among three options according to the media type and print mode to prevent fusing failure.

Media type/print mode	Fusing speed	Reason
Plain paper	1 (standard)	
Thick stock, envelopes, postcards, label OHP film (monochrome print)	1/2 (one-half speed)	To ensure good fusing performance
OHP film (color print)	1/3 (one-third speed)	To ensure good light transmission performance

- The Fusing Motor (M4) is turned at 1/3 of the normal speed during a warm-up cycle.
- The Fusing Motor (M4) is turned at half the normal speed when a print request is received.

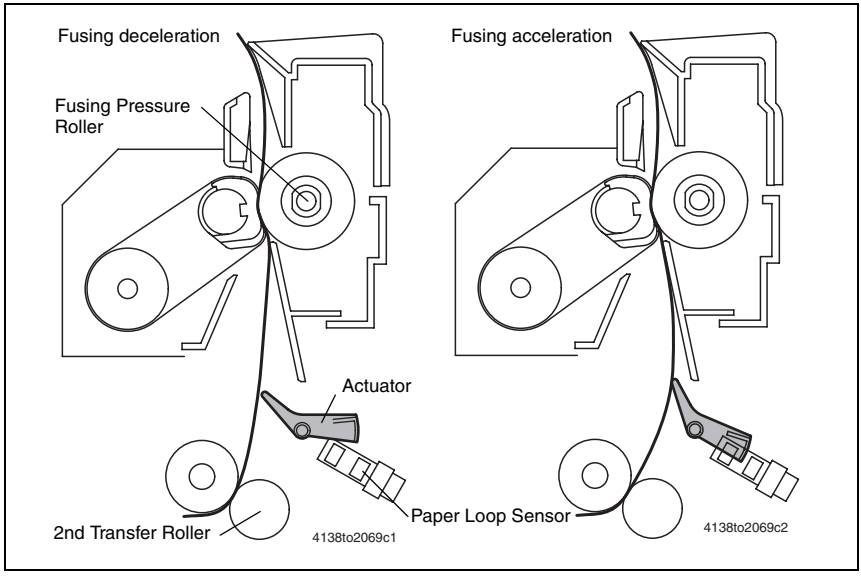
- The fusing speed is not changed during a single job.
- When the last piece of media for that particular job moves past the Paper Exit Roller, the Fusing Motor speed is switched to the 1/3 speed.

B. Fusing speed control (control of loop before fusing)

- To prevent double transferred images and brush effects from occurring, the difference between the fusing speed and the media conveyance speed during image transfer is corrected.
- The Paper Loop Sensor (PC6) detects the length of the loop formed in the media between the 2nd Transfer Roller and the Fusing Pressure Roller. The fusing speed is then varied according to the length of the loop detected. By varying the fusing speed, any effects from the Fusing Pressure Roller side (part-to-part variations, change of parts over time) are prevented from being transferred to the 2nd transfer section.
- No loop control is provided to perform the fusing process at high speeds when envelopes are used (to prevent wrinkles).

☞ 2-90

- Fusing deceleration (low speed):
 When the media loop length is small, the actuator of the Paper Loop Sensor (PC6) is pushed up a small amount and the sensor is unblocked. When the sensor is unblocked, the fusing speed is decelerated (-1.36%).
- Fusing acceleration (high speed):
 When the media loop length is large, the actuator of the Paper Loop Sensor (PC6) is pushed up a large amount and the sensor is blocked. When the sensor is blocked, the fusing speed is accelerated (+1.64%).



- Operation timing

1. The Fusing Motor (M4) is turned at low speed when the leading edge of the media reaches a point before the roller pressure point.
2. When it is detected that the Paper Loop Sensor (PC6) is unblocked, the Fusing Motor (M4) is turned at high speed. Regardless of the condition of the Paper Loop Sensor (PC6), the Fusing Motor (M4) is kept turned at high speed for a predetermined period of time after the motor speed has been switched to the high level.
3. When it is detected that the Paper Loop Sensor (PC6) is blocked, the Fusing Motor (M4) is turned at low speed. Regardless of the condition of the Paper Loop Sensor (PC6), the Fusing Motor (M4) is kept turned at low speed for a predetermined period of time after the motor speed has been switched to the low level.
4. The operations of steps 2 and 3 above are repeated.
5. When the trailing edge of the media moves past the 2nd Transfer Roller, the speed control is terminated and thereafter the Fusing Motor (M4) is turned at the normal speed.

C. Fusing Pressure Roller deformation prevention control

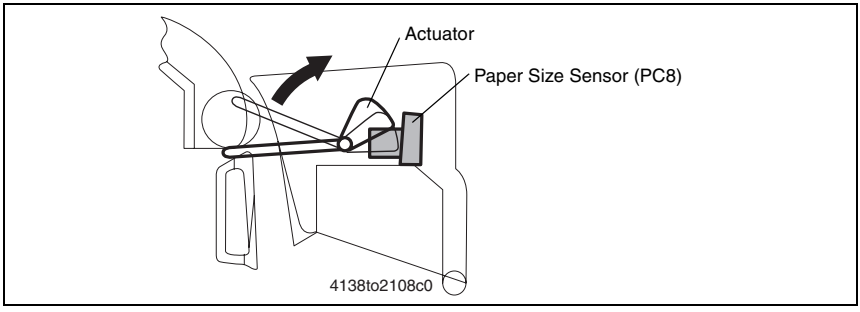
- To prevent the Fusing Pressure Roller from being deformed, the Fusing Pressure Roller is forcibly turned if it is left idle for a predetermined period of time.
- Operation timing

1. If the machine remains in the standby state for more than 13 hours, the Fusing Motor (M4) is turned at 1/3 speed for 1 sec.
2. If the machine remains in the Power Save mode for more than 14 days, a single reference temperature adjustment is performed [during which the Fusing Cooling Fan Motor (M11) is also turned] and thereafter the Fusing Motor (M4) is turned at 1/3 speed for 1 sec.

☞ 2-110

D. Media exit detection control

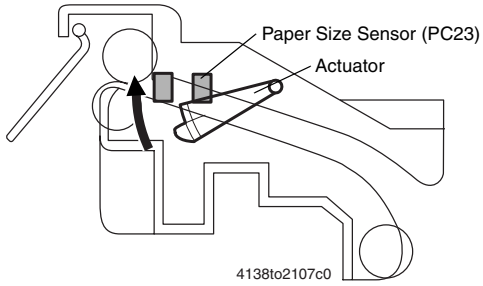
- The Exit Sensor (PC8) detects the media conveyed from the Fusing Belt and Fusing Pressure Roller.
- The leading edge of the media pushes up the Exit Sensor actuator. When the actuator blocks the Exit Sensor (PC8), the machine determines that the media has reached the exit point.
- The Exit Sensor is placed right after the Fusing Pressure Roller in order to detect the media jam and prevent the media from being wound to the Fusing Pressure Roller.



E. Media width detection control

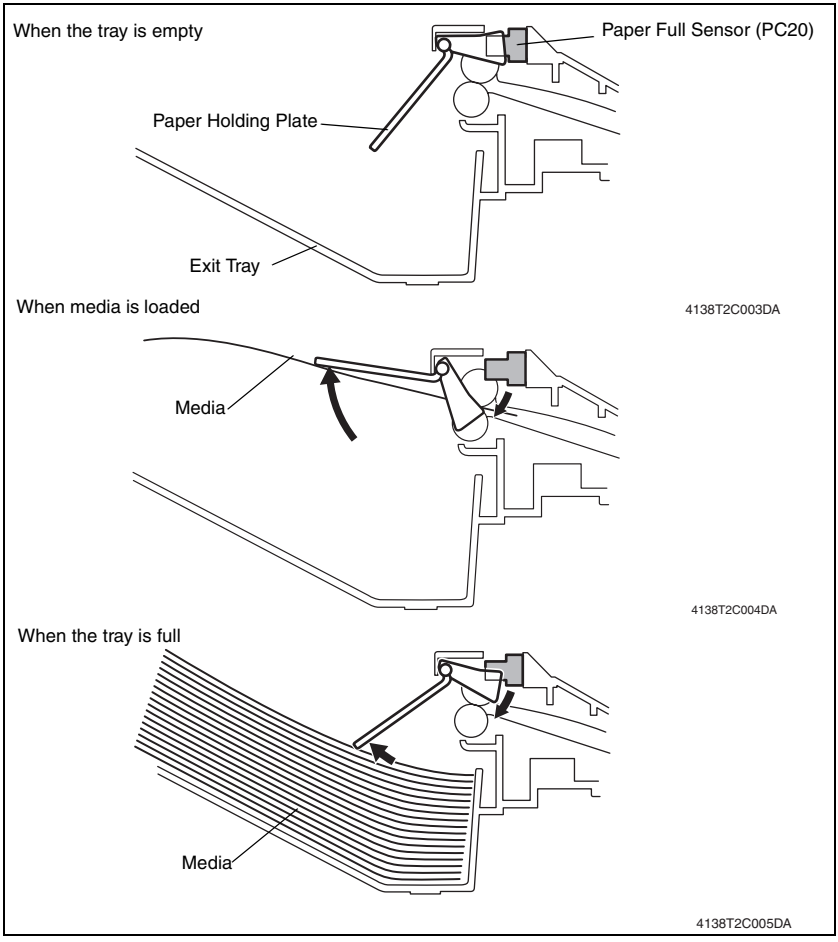
- The Paper Size Sensor (PC23) detects the width of the media being conveyed.
- If the width of the media that has moved past the Paper Size Sensor (PC23) is 210 mm (A4 width) or more, the leading edge of the media pushes up the actuator of the sensor, thus blocking the sensor. When the sensor is blocked, the machine considers that the width of the media is equivalent to A4 width or more.
- If the width of the media that has moved past the Paper Size Sensor (PC23) is less than 210 mm (A4 width), the actuator of the sensor is not moved and the sensor is left unblocked. When the sensor is unblocked, the machine considers that the width of the media is a small size (B5 size or less).
- For media size detection, the machine recognizes the media size using the media size setting made in the controller and determines it after the media has actually been fed through. The media size detection results are used in the “PPM control,” to be described later.

☞ 2-111



F. Detection of media full in the exit tray (magicolor 5450 only)

- The Paper Full Sensor (PC20) detects the load capacity of output media in the Exit Tray.
- When the Paper Holding Plate is low, the edge of the Paper Holding Plate shades the Paper Full Sensor (PC20.)
- When printing starts, the output media pushes up the Paper Holding Plate and the edge of the Plate activates the Paper Full Sensor (PC20.)
- After all media is discharged, the Paper Holding Plate goes down and the edge of the Plate shades the Paper Full Sensor (PC20.) If the sensor is shaded, the printed media is judged to not have reached the maximum load capacity yet.
- After all media is discharged, if the output media in the Exit Tray keeps the Paper Holding Plate up and the Paper Full Sensor (PC20) remains activated, the printed media is judged to have reached the maximum load capacity, and the operation panel displays the message “OUTPUT FULL REMOVE PAPER.”
- If the sensor detects that the Exit Tray is full, printing is stopped.
- The message “OUTPUT FULL REMOVE PAPER” is removed when the output media is removed from the Exit Tray, which again shades the Paper Full Sensor (PC20).



G. Print start wait control

- To ensure good fusing performance for the first print, the print start timing is retarded.
- The control also prevents the media from sticking during printing on OHP film in the color mode.
- <Operation>
 The print start timing is retarded using the value of either one of the two wait periods, whichever is longer, calculated under the following two conditions.

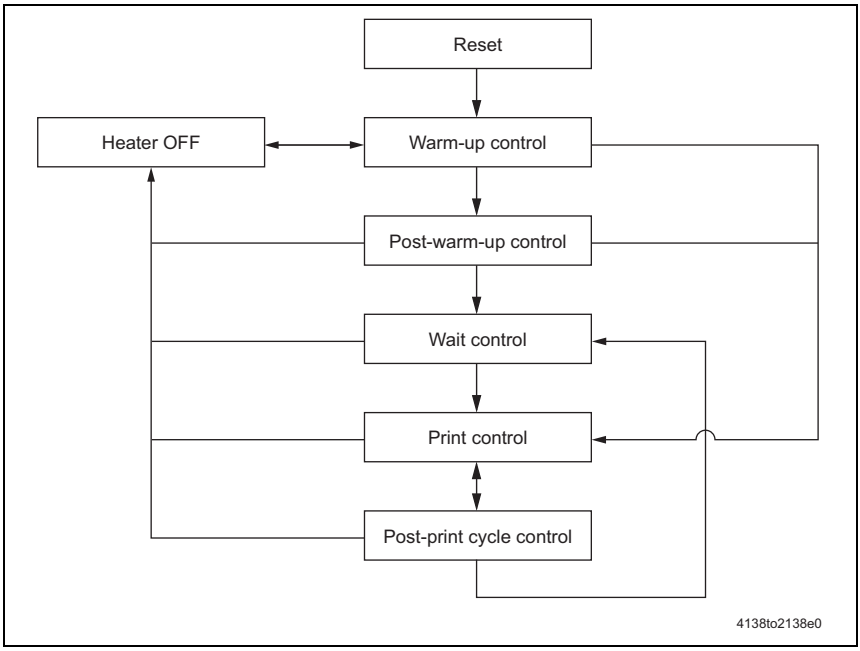
1. Using the data provided by the Temperature/Humidity Sensor (HS1) and other sensors, the period of time that begins when the print control (print start timing control) is started and ends when the first sheet of media reaches the Fusing Belt is calculated.
2. If the first print is produced on OHP film in the color mode, the wait time is calculated to ensure that the media interval is the specified value.

16.3.3 Fusing temperature control

- To fuse the toner image on the media (image yet to be permanently fixed) properly into the media, the Heater Lamps are turned ON and OFF as necessary to bring the fusing temperature to an appropriate level.
- Thermistors are used to detect the surface temperatures of the Heating Roller and Fusing Pressure Roller. The Heater Lamps are then turned ON and OFF as necessary to achieve the set temperature.
- The control temperature in the print command wait state is called the standby temperature, while that for permanently fix the toner image on media into the media is called the print temperature.

16.3.4 Fusing temperature control management

- The appropriate type of temperature control is provided according to the machine status.



A. Conditions enabling shift to warm-up control
- The Power Switch is turned ON.
- A malfunction or media misfeed is reset.
- The machine leaves the Power Save mode.
- A door is closed.

B. Condition enabling shift to post-warm-up control
- At the end of the warm-up control (no print request)

C. Conditions enabling shift to wait control
- At the end of the warm-up control (no print request)
- At the end of the post-print cycle control

D. Condition enabling shift to print control
- A print request is accepted.

E. Condition enabling shift to post-print cycle control
- At the end of the print control

F. Condition enabling shift to heater OFF control
- A malfunction or media misfeed occurs.
- A Power Save mode signal is received.

16.3.5 Warm-up control

- Control is provided until the Heating Roller reaches the predetermined level.
- The Power Save mode is not accepted during a warm-up cycle.

A. Control start timing

- The Power Switch is turned ON.
- A malfunction or media misfeed is reset.
- The machine leaves the Power Save mode.
- A door is closed.

B. Control termination timing

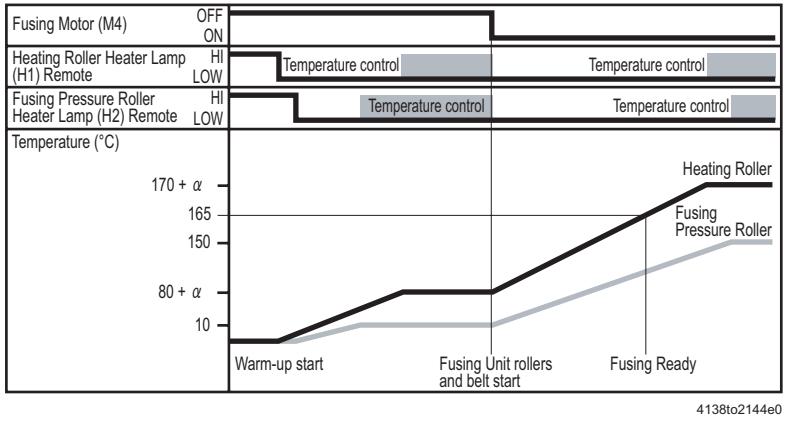
- A malfunction or media misfeed is reset.
- A door is opened.

C. Control start decision

- If the information provided by the Temperature/Humidity Sensor (HS1) is less than a predetermined value, the low temperature start control is provided.
- If the information provided by the Temperature/Humidity Sensor (HS1) is the predetermined value or more, the ordinary start control is provided.

D. Low temperature start control

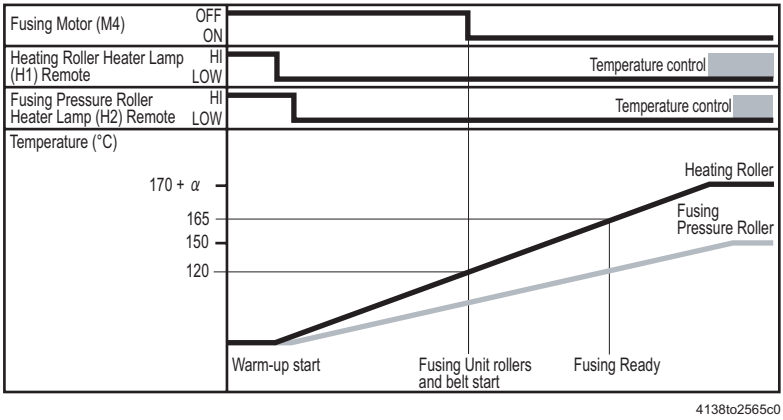
1. The “single reference temperature adjustment” is started with the target temperature of the Heating Roller Heater Lamp set at 80°C + correction value. At the same time, the “single reference temperature adjustment” is started with the target temperature of the Fusing Pressure Roller Heater Lamp set at 10°C.
2. The control proceeds to “ordinary start control” after the lapse of a predetermined period of time after the Heating Roller temperature has reached the target value.
3. The control proceeds to “heater OFF control” if an event of control termination timing occurs during control.



Warm-up cycle control diagram during low temperature start

E. Ordinary start control

1. The “single reference temperature adjustment” is started with the target temperature of the Heating Roller Heater Lamp set at 170°C + correction value. At the same time, the “single reference temperature adjustment” is started with the target temperature of the Fusing Pressure Roller Heater Lamp set at 150°C.
2. If the Heating Roller temperature reaches a level of 120°C or more, both the Fusing Pressure Roller and Fusing Belt are turned at the specified speed. Or, when a predetermined period of time elapses, the Fusing Pressure Roller and Fusing Belt are turned at the specified speed.
3. If the control has proceeded from “low temperature start control,” the Fusing Pressure Roller and Fusing Belt are turned at the specified speed.
4. If the Heating Roller temperature becomes 165°C or more and the Fusing Pressure Roller temperature becomes 70°C or more after the lapse of a predetermined period of time after the Fusing Unit rollers and belt have been rotated, the “fusing Ready” state is set.
5. If a print request is received after the “fusing Ready” state, the control proceeds to “print control (print start control).”
6. If the Heating Roller temperature becomes 170°C + the correction value or more, the control proceeds to “post-warm-up control.”
7. The control proceeds to “heater OFF control” if an event of control termination timing occurs during control.



Warm-up cycle control diagram during ordinary start

16.3.6 Post-warm-up control

- After the warm-up cycle has been completed, the Fusing Pressure Roller and Fusing Belt are turned to achieve a uniform temperature.
- If the Heating Roller and the Fusing Pressure Roller have reached their respective required temperatures, the machine considers that the Fusing Unit rollers and belt have reached the specified temperatures. It then terminates the post-warm-up control sequence.

A. Control start timing

- At the end of the warm-up control (no post-warm-up control sequences are performed if a print request is received)

B. Control termination timing

- A predetermined period of time elapses after the post-warm-up control has been started.
- The temperature of the Heating Roller reaches 170°C + correction value and that of the Fusing Pressure Roller reaches 150°C or more.
- A Power Save mode signal is received.

C. Control operation timing

1. The Fusing Pressure Roller and Fusing Belt are turned at the specified speed.
2. The “ripple prediction temperature adjustment” is started with the target temperature of the Heating Roller Heater Lamp set at 170°C + correction value. At the same time, the “ripple prediction temperature adjustment” is started with the target temperature of the Fusing Pressure Roller Heater Lamp set at 150°C.
3. Rotation is stopped after the lapse of a predetermined period of time after the post-warm-up control has been started and the control proceeds to “wait control.” Or, if the temperatures of the Fusing Pressure Roller and Fusing Belt have reached the specified levels, rotation is stopped and the control proceeds to “wait control.”
4. If a print request is received during the control, the control proceeds to “print control.”
5. If a malfunction or media misfeed occurs during control, the control proceeds to “heater OFF control.”

16.3.7 Wait control

- Control is provided to ensure that the temperatures at different parts of the Fusing Unit reach a constant level during the wait state.

A. Control start timing

- At the end of the post-warm-up control
- At the end of the post-print cycle control (print start control)

B. Control termination timing

- A print request is received.
- A malfunction or media misfeed occurs.
- A Power Save mode signal is received.

C. Control operation timing

1. The “hysteresis temperature adjustment” is started with the target temperature of the Heating Roller Heater Lamp set at 170°C + correction value. At the same time, the “hysteresis temperature adjustment” is started with the target temperature of the Fusing Pressure Roller Heater Lamp set at 150°C.
2. If a print request is received during the wait state, the control proceeds to “print control.”
3. If a malfunction or media misfeed occurs or a Power Save request is made during the wait state, the control proceeds to “heater OFF control.”

16.3.8 Print control

- To ensure a good fixing level and light transmission performance of the OHP film, the fusing speed, Fusing Pressure Roller temperature, and Fusing Belt temperature are controlled.

A. Control start timing

- A print request is received.

B. Control termination timing

- A malfunction or media misfeed occurs.

C. Control operation timing

1. The Fusing Pressure Roller and Fusing Belt are turned at the specified speed.
2. The “single reference temperature adjustment” is started with the target temperature of the Heating Roller Heater Lamp set at 170°C + correction value. At the same time, the “single reference temperature adjustment” is started with the target temperature of the Fusing Pressure Roller Heater Lamp set at 150°C.
3. If the temperature of the Heating Roller reaches the target value, the control of the Heating Roller Heater Lamp proceeds to the “hysteresis temperature adjustment.” If the temperature of the Fusing Pressure Roller reaches the target value, the control of the Fusing Pressure Roller Heater Lamp proceeds to the “ripple prediction temperature adjustment.”
4. When the leading edge of the first sheet of media moves past the Synchronizing Roller, the Fusing Pressure Roller and Fusing Belt are turned at the specified speed corresponding to the type of the media.
5. If there is another sheet of media to be printed when the trailing edge of the preceding sheet of media moves past the Fusing Pressure Roller/Fusing Belt, the Heating Roller Heater Lamp temperature, Fusing Pressure Roller Heater Lamp temperature, and the fusing speed are changed to the settings that correspond to that particular piece of media.
6. After the trailing edge of the last sheet of media moves past the Exit Roller, the control proceeds to “post-print cycle control.”
7. If a malfunction or media misfeed occurs during a print cycle, the control proceeds to “heater OFF control.”

16.3.9 Post-print control

- To prevent the fusing temperature from rising after the print cycle has been run, a stepwise control is provided using an intermediate temperature between the print temperature and the wait temperature.

A. Control start timing

- There is no new print request received when the trailing edge of the last sheet of media has moved past the Exit Roller.

B. Control termination timing

- A predetermined period of time elapses after the post-print cycle control has been started.
- A print request is received.
- A door is opened, or an error or malfunction occurs.

C. Control operation timing

1. The Fusing Pressure Roller and Fusing Belt are turned at the specified speed.
2. The “ripple prediction temperature adjustment” is started with the target temperature of the Heating Roller Heater Lamp set at 160°C + correction value. At the same time, the “ripple prediction temperature adjustment” is started with the target temperature of the Fusing Pressure Roller Heater Lamp set at 140°C.
3. The Fusing Pressure Roller and Fusing Belt are stopped after the lapse of a predetermined period of time after the post-print cycle control has been started.
4. The control proceeds to “wait control” after the lapse of another predetermined period of time after the post-print cycle control has been started.
5. The control proceeds to “print control” if a print request is received during the post-print cycle control.
6. The control proceeds to “heater OFF control” if a malfunction or media misfeed occurs during the post-print cycle control.

16.3.10 Heater OFF control

- Heater control is suspended when a malfunction or media misfeed occurs or a Power Save mode signal is received.

A. Control start timing

- A door is opened or an error or malfunction occurs.
- A Power Save mode signal is received.

B. Control termination timing

- All of the following events are reset: an open door, an error or malfunction that has occurred, a Power Save mode signal that has been received.

C. Control operation details

1. A request for heater forced turning OFF control is made for heater control.
2. A request is made for stopping rotation of the Fusing Pressure Roller and Fusing Belt.

16.3.11 Heater control

A. Single reference temperature adjustment
- The heater is turned ON or OFF using a target temperature value.

B. Hysteresis temperature adjustment
- The heater is turned ON or OFF with a certain allowance given for the threshold value of turning ON or OFF the heater.

C. Ripple prediction temperature adjustment
- The heater is turned ON or OFF by determining whether the temperature is on the increase or decrease within a set temperature range.

16.3.12 PPM control

- When a multi-print cycle is run, the temperature of the Fusing Pressure Roller and the Fusing Belt decrease, resulting in the fusing performance of the printed image being degraded.
 To prevent this problem, fusing performance is estimated based on the surface temperature of the Fusing Pressure Roller; the distance between sheets of media is widened according to the media length and fusing speed, thereby allowing the Fusing Pressure Roller and the Fusing Belt to recover the required temperature; the fusing performance of the printed toner image is thus ensured.
- If a multi-print cycle is run using media of a small size, a difference is produced in temperature between the center portion of the roller/belt (the surface over which the media moves past) and the edges of the roller/belt (where no part of the media moves past). Since the thermistor is located at the center portion, the machine determines that there is a drop in roller temperature and turns ON the heater to increase the roller temperature. This also heats the edges of the roller, at which a high temperature is still maintained. This increases the overall temperature.
 To inhibit this situation, the distance between sheets of media is widened and the temperature of the Fusing Pressure Roller and Fusing Belt is thereby made uniform.

A. Control start timing
- In an ambience of low temperature and low humidity
- In an ambience of high temperature and high humidity
- Media of a small size is detected through media width detection control.

☞ 2-102

- The Heating Roller temperature becomes lower than a predetermined level.
- Media of a small size is detected through media width detection control.

B. Control termination timing
- The control proceeds to “wait control” or “heater OFF control” during the PPM control.
- The media that requires no PPM control is fed through during PPM control.

16.4 Malfunction detection

16.4.1 Fusing Unit malfunctions

- The following table lists the seven types of malfunctions as they relate to the Fusing Unit.

Malfunction code	Description	Defective component
0060	Fusing Motor abnormal rotation	Fusing Motor (M4)
0500	Warm-up failure	Heating Roller Heater Lamp (H1)
	Open-circuited thermistor (incorrect installation)	Heating Roller Thermistor (TH1)
	Abnormal temperature increase rate	
0501	Warm-up failure	Fusing Pressure Roller Heater Lamp (H2)
	Open-circuited thermistor (incorrect installation)	Fusing Pressure Roller Thermistor (TH2)
0510	Abnormally low temperature	Heating Roller Heater Lamp (H1)
0511	Abnormally low temperature	Fusing Pressure Roller Heater Lamp (H2)
0520	Abnormally high temperature	Heating Roller Heater Lamp (H1)
0521	Abnormally high temperature	Fusing Pressure Roller Heater Lamp (H2)

16.4.2 Fusing Motor abnormal rotation detection control

- The condition of the Fusing Motor (M4) while it is rotating is monitored and, if an abnormal rotation is detected, “Fusing Motor abnormal rotation 060” is displayed.

A. Detection operation

- The machine determines that the Fusing Motor (M4) is in a good rotating condition if the motor maintains a steady-state rotating condition continuously for a predetermined period of time or more during its stable rotation.
- The Fusing Motor is considered to be abnormal if it fails to rotate in a steady state even after the lapse of a predetermined period of time during its stable rotation.
- The Fusing Motor is considered to be abnormal if a Fusing LOCK signal is not detected even after the lapse of a predetermined period of time after the machine has determined that the motor rotates in a steady state.

16.4.3 Warm-up failure detection control

- The temperatures of the Heating Roller and Fusing Pressure Roller are monitored using the Heating Roller Thermistor (TH1) and Fusing Pressure Roller Thermistor (TH2) during a warm-up cycle. If an abnormal rise in temperature is detected, “warm-up failure 0500/0501” is displayed.

A. Detection start timing
- At the start of the warm-up control
- At the start of the low temperature start control
- During rotation under the Fusing Pressure Roller deformation prevention control

B. Detection termination timing
- At the end of the warm-up control
- At the end of the low temperature start control
- At the end of the Fusing Pressure Roller deformation prevention control
- The detection reference temperature for the above control is reached.

C. Detection condition
- The temperatures of the Heating Roller and Fusing Pressure Roller do not reach the control temperatures within a predetermined period of time after the warm-up control has been started.

16.4.4 Abnormally low temperature detection control

- The temperatures of the Heating Roller and Fusing Pressure Roller are monitored using the Heating Roller Thermistor (TH1) and Fusing Pressure Roller Thermistor (TH2) after the warm-up cycle. If an abnormally low temperature is detected, “abnormally low temperature 0510/0511” is displayed.

A. Detection start timing
- At the completion of the warm-up cycle

B. Detection termination timing
- A malfunction or media misfeed occurs.
- A door is opened.

C. Detection condition
- The temperatures of the Heating Roller and Fusing Pressure Roller remain below a predetermined level for a predetermined period of time or more.

16.4.5 Abnormally high temperature detection control

- The temperatures of the Heating Roller and Fusing Pressure Roller are monitored using the Heating Roller Thermistor (TH1) and Fusing Pressure Roller Thermistor (TH2) while the machine remains active. If an abnormally high temperature is detected, “abnormally high temperature 0520/0521” is displayed.

A. Detection start timing
- The Power Switch is turned ON.

B. Detection termination timing
- The Power Switch is turned OFF.

C. Detection conditions
- The temperature detected by the Heating Roller Thermistor (TH1) becomes 230°C or more.
- The temperature detected by the Heating Roller Thermistor (TH1) is 220°C or more and, at the same time, the temperature gradient for a 1-sec. period exceeds 11°C.
- The temperature detected by the Fusing Pressure Roller Thermistor (TH2) becomes 196°C or more during a predetermined period of time after a door has been opened or an error or malfunction has occurred.
- The temperature of the Fusing Pressure Roller (after correction) becomes 220°C or more.

16.4.6 Open-circuited Heating Roller Thermistor (incorrect installation) detection control

- The temperature detected by the Heating Roller Thermistor (TH1) during a warm-up cycle is monitored and, if an abnormal temperature is detected, “warm-up failure 0500” is displayed.

A. Detection start timing
- At the start of the low temperature start control
- At the start of the warm-up control

B. Detection termination timing
- The temperature detected by the Heating Roller Thermistor (TH1) reaches the control temperature (warm-up control temperature).
- A predetermined period of time elapses after the start of control.

C. Detection conditions
- The temperature detected by the Heating Roller Thermistor (TH1) increases by less than 3°C for the period of time that begins when the low temperature start control is started and ends when 2 sec. elapse thereafter.
- The temperature detected by the Heating Roller Thermistor (TH1) increases by less than 7°C for the period of time that begins when the low temperature start control is started and ends when 3 sec. elapse thereafter.
- The difference between the maximum and minimum temperatures detected by the Heating Roller Thermistor (TH1) for the 3-sec. period after the warm-up cycle has been started is less than 5°C.
- The difference between the maximum and minimum temperatures detected by the Heating Roller Thermistor (TH1) for the 3-sec. period after the warm-up cycle has been started is 50°C or more.

16.4.7 Open-circuited Fusing Pressure Roller Thermistor (incorrect installation) detection control

- The temperature detected by the Fusing Pressure Roller Thermistor (TH2) during a warm-up cycle is monitored and, if an abnormal temperature is detected, “warm-up failure 0501” is displayed.

A. Detection start timing

- A detection sequence is started when the following three conditions are met:

1. At the start of the warm-up control
2. The fusing rollers are turning.
3. The temperature detected by the Heating Roller Thermistor (TH1) is higher than the correction temperature of the Fusing Pressure Roller.

- If the temperature detected by the Heating Roller Thermistor (TH1) is lower than the correction temperature of the Fusing Pressure Roller, the internal state in the middle of the detection sequence is reset and, if the detection conditions are met again, the sequence is started anew.

B. Detection termination timing

- The temperature of the Fusing Pressure Roller after correction reaches the warm-up control temperature -3°C (147°C).
- At the end of the warm-up control or post-warm-up control

C. Detection conditions

- The temperature detected by the Heating Roller Thermistor (TH1) after the lapse of 21 sec. after the start of detection sequence does not increase by 3°C or more as compared with that at the start of the sequence when the Fusing Pressure Roller correction temperature is less than 147°C.
- The temperature after each period of 1 sec. does not increase by 3°C or more as compared with that 21 sec. ago after the detection sequence.

16.4.8 Abnormal temperature increase rate detection control

- The temperature of the Heating Roller is monitored using the Heating Roller Thermistor (TH1) during a warm-up cycle. If an abnormal temperature increase rate is detected, “warm-up failure 0500” is displayed.

A. Detection start timing

- The temperature of the Heating Roller is less than the specified level during the warm-up control.

B. Detection termination timing

- The temperature of the Heating Roller reaches the specified level during the warm-up control.

C. Detection conditions

1. The temperature of the Heating Roller at the start of the detection is recorded.
2. The temperature of the Heating Roller 1 sec. after the recording is compared with that recorded.
3. The malfunction is detected if the difference in temperature exceeds 11°C.
4. If the temperature difference is 11°C or less, the current Heating Roller temperature is recorded and then the detection operation is repeated starting with step 2.

16.4.9 Protection against abnormally high temperature

- The machine provides protection at three different stages to prevent abnormally high temperature of the Fusing Unit.

1. Soft protection
2. Hard protection
3. Thermostat protection

A. 1st stage: soft protection

- If the Heating Roller Thermistor (TH1) and the Fusing Pressure Roller Thermistor (TH2) detect a temperature exceeding a predetermined value, the malfunction code representing abnormally high temperature is displayed. At this time, the Heater Lamps are turned OFF forcibly and the initiation of any new print cycle is prohibited (abnormally high temperature detection control).

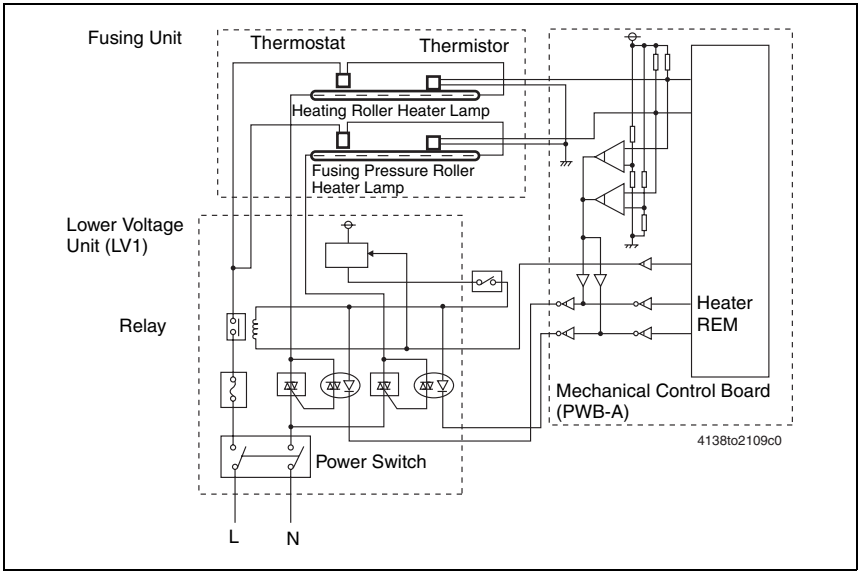
B. 2nd stage: hard protection

- The following hard protection control is provided if the CPU overruns and becomes unable to detect an abnormally high temperature.

1. The Heating Roller Thermistor (TH1) and Fusing Pressure Roller Thermistor (TH2) detect a temperature exceeding a predetermined value.
2. The Remote signal for the corresponding Heater Lamp of the Low Voltage Unit (LV) is forcibly turned OFF through the Mechanical Control Board (PWB-A).
3. The triac on the Lower Voltage Unit (LV) is turned OFF to shut down the power supply to the corresponding Heater Lamp.
4. The Heater Lamp is forcibly turned OFF.
5. The temperature detected by the Heating Roller Thermistor (TH1) and Fusing Pressure Roller Thermistor (TH2) is decreased to a level below the predetermined value.
6. The Remote signal forcible OFF of the corresponding Heater Lamp is reset so that power supply to the Heater Lamp is resumed. This operation is repeated until the CPU recovers to be able to detect the abnormally high temperature condition. This control allows the power supply to the corresponding Heater Lamp to be shut down before the thermostat operates, inhibiting the Fusing Unit from being damaged.

C. 3rd stage: Thermostat protection

- If neither the soft protection nor hard protection can detect an abnormally high temperature due to a defective thermistor, the Heating Roller Thermostat (TS1) and Fusing Pressure Roller Thermostat (TS2) operate at the specified temperature. This shuts down the power supply to the Heating Roller Heater Lamp (H1) and Fusing Pressure Roller Heater Lamp (H2), thus forcibly turning them OFF.



17. Image Stabilization Control

- To ensure that a stabilized output image is produced at all times, a comprehensive control is provided for the developing bias voltage, laser light intensity, registration correction, gamma correction, and other parameters.

17.1 Overview of image stabilization control

- Image stabilization control may be divided into two types: complete and full correction control. The following explain specific details of each type of control.

17.1.1 Complete correction control

- Controls 1 through 6 below are collectively called the “complete correction control.”
- For details of each of these controls, see the relevant page.

	Control name	Purpose
1	AIDC Sensor calibration control ☞ 2-65	Changes in various types of characteristics due to change with time of the AIDC Sensor (deteriorated LED, dirty sensor surface), part-to-part variations in the sensors, and change of environment affect the AIDC Sensor output corresponding to the clear Transfer Belt surface. To correct fluctuations in the output, the sensor LED intensity is adjusted so as to keep constant the AIDC Sensor output value.
2	Developing bias Vpp control ☞ 2-33	If the developing bias voltage (Vpp) is too high for the Ds distance in each Toner Cartridge, a leak image (background leak, image area leak) results. If Vpp is excessively low, halftone reproducibility becomes poor. This control detects a Vpp range, in which no image failure occurs, to set the optimum Vpp.
3	Developing bias duty control (control of the maximum amount of toner sticking to the Transfer Belt) ☞ 2-34	To correct the target amount of toner sticking to the Transfer Belt to form the solid image.
4	Laser light intensity control ☞ 2-6	To correct the target level of fluctuations in fine line reproduction and reverse image (white on black) reproduction that occur due to variations in photo conductor electrostatic characteristics, developing characteristics, and transfer characteristics (part-to-part variations, environment, durability).
5	Gamma characteristics detection control ☞ 2-35	To correct the tone by using the AIDC Sensor to measure the density of a gradation pattern produced on the Transfer Belt and sending the results of the measurement to the controller.
6	Registration correction control ☞ 2-6	To correct incorrect color registration that occurs due to variations in parts of the machine used for regulating different drawing positions.

17.1.2 Simplified correction control

- If the simplified correction control is not effective in making a good correction, the complete correction control is executed.

	Control name	Purpose
1	AIDC Sensor offset value check ☞ 2-65	To check the low gain output value and offset voltage value of the AIDC Sensor when the shutter is closed.
2	Check of AIDC Sensor output corresponding to clear Transfer Belt surface ☞ 2-65	To check the low gain output value of the AIDC Sensor using the intensity value set last for the clear Transfer Belt surface on which no toner sticks.
3	Developing bias control (simplified Vpp check) ☞ 2-33	To determine whether there is a leak based on the measurement value taken last.
4	Developing bias duty control (control of the maximum amount of toner sticking to the Transfer Belt) ☞ 2-34	To correct the amount of toner based on the measurement value taken last.
5	Laser light intensity control (simplified correction control) ☞ 2-6	To correct based on the measurement value taken last.
6	Registration correction control (simplified control) ☞ 2-6	To correct incorrect color registration that occurs due to variations in parts of the machine used for regulating different drawing positions. The simplified control uses a simplified registration pattern to make the correction.

17.1.3 Image stabilization control execution request

- A request for execution of the complete correction control or simplified correction control is made at the following timing.

Stabilization request timing		Stabilization request detection timing	Execution processing
Upon replacement of unit	When a new TC is detected	When the Power Switch is turned ON	Complete correction control
	When the Transfer Belt Unit is replaced *1	When the Front/Right Door is closed	Complete correction control
By machine status	When the Power Switch is turned ON	Power the Switch is turned ON	Simplified correction control
	When there is a change in environmental conditions from those when the last stabilization sequence was executed	At the end of a job	
	At the end of a print cycle of given conditions *2	At the end or during a job	
	When a malfunction is reset	• When the Power Switch is turned ON • When the Front/Right Door is closed	
	When simplified correction control is executed	After simplified correction control is executed	Gamma correction control, registration correction control, or complete correction control
	When the temperature of the print head unit changes over the specified range from the one at the previous stabilization.	Always	Register adjustment control
User selection	When Engine/Engine Service/Calibration is selected	When Engine/Engine Service/Calibration is selected	Complete correction control

*1: Since the machine is not provided with a function that detects a new Transfer Belt Unit, Engine/Engine Service/Calibration must be selected and complete correction control executed whenever the unit has been replaced with a new one.

*2: See the following for the conditions that enable execution of the stabilization control at the end of a print cycle of given conditions.

17.1.4 Conditions enabling execution of stabilization control at the end of a print cycle of given conditions

- The time equivalent to the number of printed pages produced by each TC is counted after the execution of the last image stabilization sequence.
- The equivalent time counter of all TCs is reset after the execution of the image stabilization sequence.

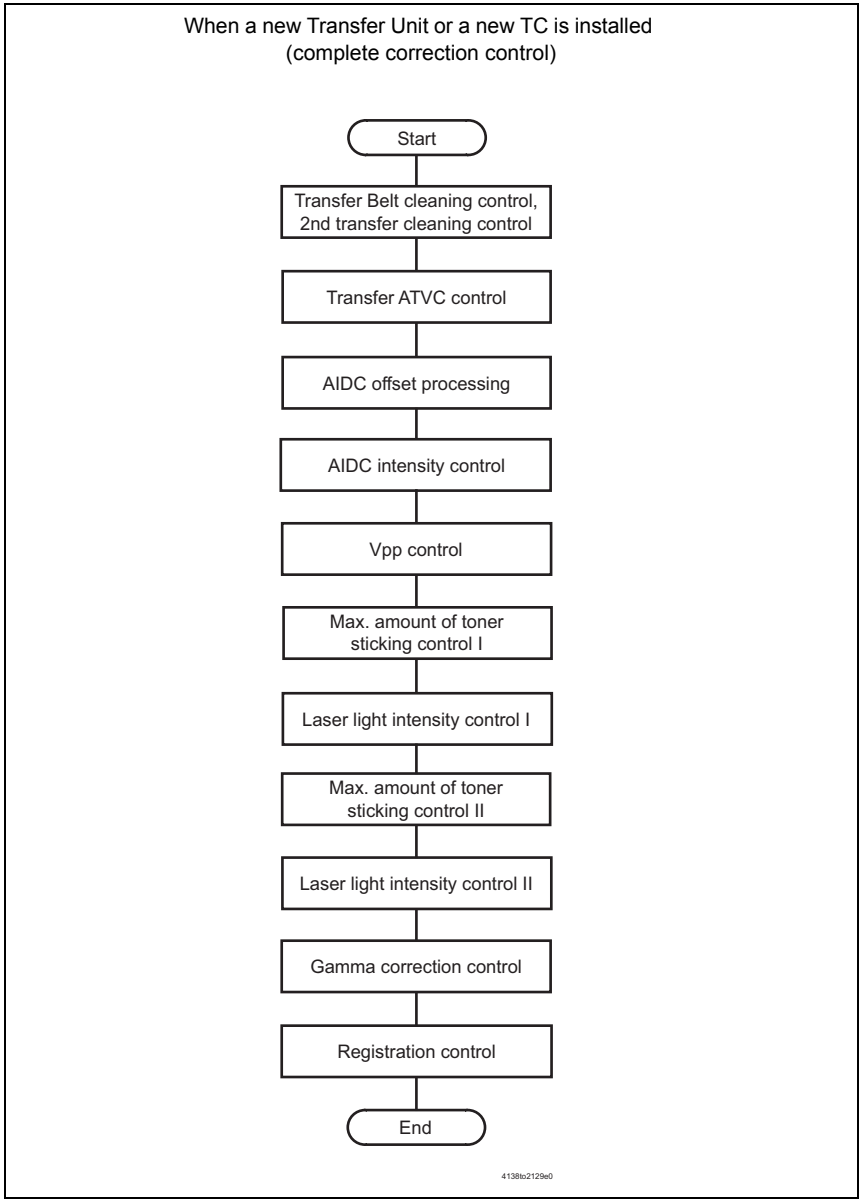
A. Calculation of equivalent printed page time

- The period of time through which the Developing Unit is driven is used for the equivalent printed page time.
- Half of the Developing Unit driving time involved with 2P/J is one printed page time.

17.1.5 Combination and execution sequence of different sub-controls

Control name		Simplified control	Individual control 1	Individual control 2	Complete correction control
AIDC Sensor calibration control ☞ 2-65	Simplified correction control (check)	①			
	Complete correction control				①
Developing bias Vpp control ☞ 2-33	Simplified correction control (check)	②			
	Complete correction control				②
Developing bias duty control (control of the maximum amount of toner sticking to the Transfer Belt) ☞ 2-34	Simplified correction control	③			
	Complete correction control				③, ⑤
Laser light intensity control ☞ 2-6	Simplified correction control	④			
	Complete correction control				④, ⑥
Gamma correction control ☞ 2-35				①	⑦
Registration correction control ☞ 2-6	Simplified correction control	⑤			
	Complete correction control		①		⑧

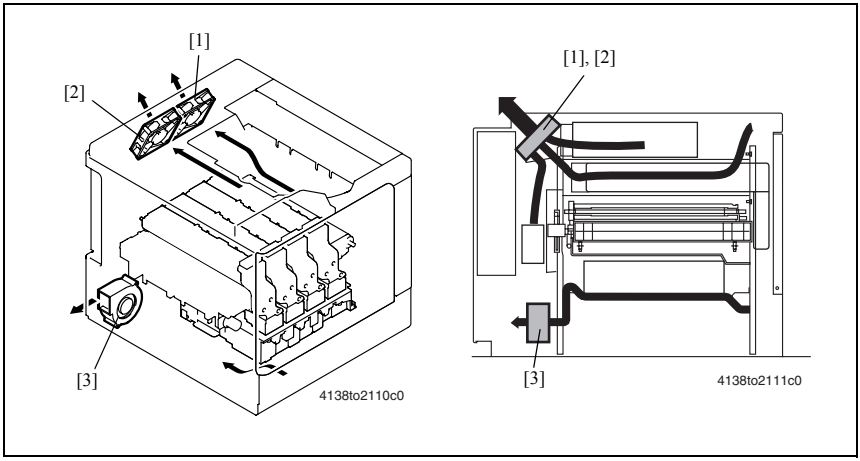
17.2 Operation flow of image stabilization control upon replacement of unit



18. Miscellaneous

18.1 Fan control

18.1.1 Composition



Key	Name	Function/system
[1]	Fusing Cooling Fan Motor (M11)	• Discharges heat generated from the interior parts (including the Low Voltage Unit, Fusing Unit, Toner Cartridges/K, and motor drives) from the machine to prevent the interior temperature from rising inordinately. • Air passageway is formed on top of the Low Voltage Unit, in the duct inside the Toner Cartridge rail, and below the print head housing. No air flows through areas around the Toner Cartridges. This effectively prevents toner from scattering.
[2]	LV Cooling Fan Motor (M10)	• Discharges heat generated from the interior parts (including the Low Voltage Unit, intermediate transfer belt section, Toner Cartridges/C, M, Y, and motor drives) from the machine to prevent the interior temperature from rising inordinately.
[3]	Ozone Ventilation Fan Motor (M12)	• Discharges heat generated from the print head from the machine to prevent the print head temperature from becoming inordinately high. • Removes ozone produced from the Toner Cartridges and charging section. • Air passageway is formed on top of the Low Voltage Unit, in the duct inside the Toner Cartridge rail, and below the print head housing. No air flows through areas around the Toner Cartridges. This effectively prevents toner from scattering.

18.1.2 Control

A. LV Cooling Fan Motor (M10) control

<Full speed rotation conditions>
- For the period of time that begins when the warm-up cycle is started and ends when a predetermined period of time elapses after the warm-up cycle has been completed.
- For the period of time that begins when the Intermediate Transport Motor (M3) is energized and ends when a predetermined period of time elapses after the motor is de-energized.
- For the period of time during which the Fusing Pressure Roller deformation prevention control is performed

<Half speed rotation conditions>
- The motor runs at a half speed during any time other than above.
- The motor runs at a half speed only when printing in monochrome mode without a Duplex Option or optional Lower Feed Unit (magicolor 5440 DL/5450 only).

<Stop conditions>
- Stopped in the Power Save mode. The motor is, however, run while the Ozone Ventilation Fan Motor (M12) is running and stopped after the Ozone Ventilation Fan Motor (M12) has been stopped. At this time, the motor is run at full speed for a predetermined period of time after the Intermediate Transport Motor (M3) has been stopped and is run at half speed thereafter.

<Forced stop condition>
- A door is opened or a malfunction occurs, but not when an error occurs.

B. Fusing Cooling Fan Motor (M11) control

<Full speed rotation conditions>
- For the period of time that begins when the Intermediate Transport Motor (M3) is energized and ends when a predetermined period of time elapses after the motor is de-energized.

<Half speed rotation conditions>
- The motor runs at a half speed during any time other than above.

<Stop conditions>
- Stopped in the Power Save mode. The motor is not, however, stopped for a predetermined period of time after the Intermediate Transport Motor (M3) is de-energized.

<Forced stop condition>
- A door is opened or a malfunction occurs, but not when an error occurs.

C. Ozone Ventilation Fan Motor (M12)

<Full speed rotation conditions>
- At the start of a warm-up cycle
- The Intermediate Transport Motor (M3) is energized.

<Stop conditions>
- A predetermined period of time elapses after a warm-up cycle is completed
- A predetermined period of time elapses after the Intermediate Transport Motor (M3) is de-energized
- Stopped in the Power Save mode. The motor is not, however, stopped for a predetermined period of time after a predrive or a print cycle is completed.

<Forced stop condition>
- A door is opened or a malfunction occurs, but not when an error occurs.

KONICA MINOLTA

SERVICE MANUAL THEORY OF OPERATION

Lower Feeder Unit

2005.04
KONICA MINOLTA BUSINESS TECHNOLOGIES, INC. Ver. 2.0

CONTENTS

I Outline

1. Product specifications 1-1
 - 1.1 Type 1-1
 - 1.2 Paper type 1-1
 - 1.3 Machine specifications 1-1
 - 1.4 Operating environment 1-1

II Composition/Operation

1. Overall composition 2-1
2. Drive 2-3
3. Operations 2-3
 - 3.1 Paper feed control 2-3
 - 3.1.1 Paper Lift Plate mechanism 2-3
 - 3.1.2 Feed Roller/Vertical Conveyance Roller control 2-4
 - 3.1.3 Paper separation mechanism 2-5
 - 3.1.4 Paper detection mechanism 2-5
 - 3.1.5 Paper supply level detection control 2-6
 - 3.1.6 Paper empty condition detection control 2-6
 - 3.1.7 Edge Guide Plate 2-7
 - 3.1.8 Trailing Edge Guide Plate 2-7
 - 3.1.9 Paper size detection control 2-8
 - 3.1.10 Paper reference position adjustment mechanism 2-9
 - 3.1.11 Paper misfeed detection control 2-9

I Outline

1. Product specifications

1.1 Type

Name	Add-on 500-sheet paper feed cassette
Type	Front-loading type
Installation	Desk type
Paper Feeding System	Paper separation by a small-diameter roller with torque limiter
Document Alignment	Center

1.2 Paper type

Paper Size	B5/A4/Letter/Executive/Government Legal/Letter Plus
Paper Type	• Plain paper: 60 to 90 g/m^2 (16 to 24 lb) • Recycled paper: 60 to 90 g/m^2 (16 to 24 lb)
Capacity	500 sheets

1.3 Machine specifications

Power Requirements	DC 24 V ± 10% (supplied from the main unit)
	DC 5 V ± 5%
Max. Power Consumption	16 W
Dimensions	448 mm (W) × 520 mm (D) × 111.5 mm (H) 17.6 inch (W) × 4.4 inch (D) × 20.5 inch (H)
Weight	Approx. 6.5 kg (14.25 lb)

1.4 Operating environment

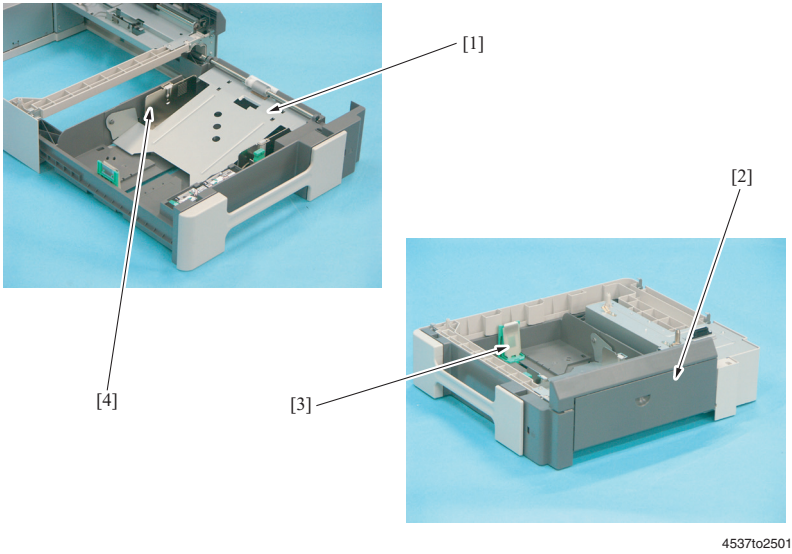
Temperature	10° to 30° C/50° to 95° F (with a fluctuation of 10° C/h (18° F/h))
Humidity	15% to 85% (with a fluctuation of 20%/h)

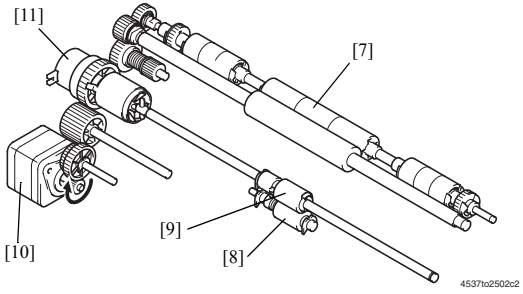
Note

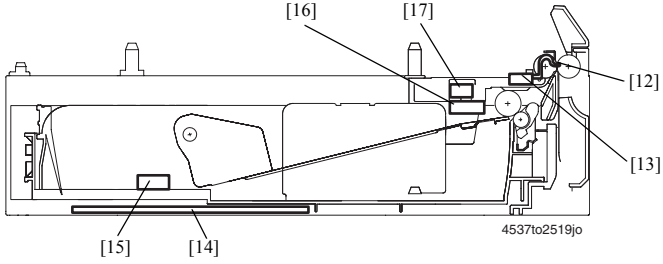
- **These specifications are subject to change without notice.**

II Composition/Operation

1. Overall composition

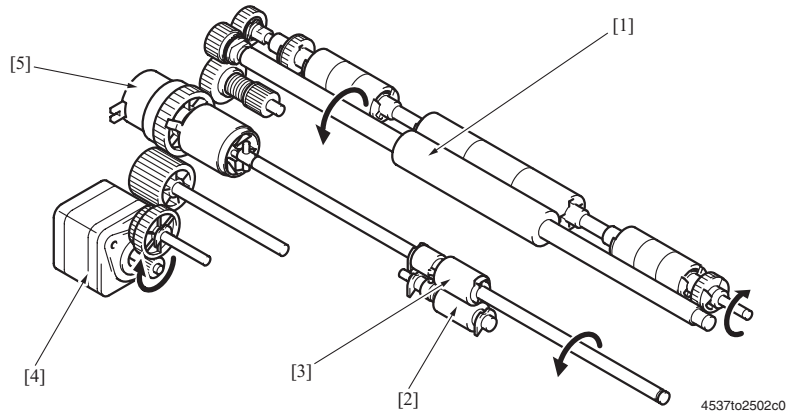






Key	Name	Function/system
[1]	Paper Lift Plate	• Surface on which the paper stack is placed • Maximum paper capacity Plain paper: 500 sheets
[2]	Lower Feeder Unit Right Door	• Open to clear a sheet of misfed paper from the Lower Feeder Unit.
[3]	Auxiliary Guide	• Guides the paper conveyed toward the machine. • Covers the Vertical Conveyance Roller. • If two Lower Feeder Units are installed, remove the Auxiliary Guide on the side of Tray 3.
[4]	Paper Level Indicator Lever	• Indicates the level of the paper still available for use in the Lower Feeder Unit.
[5]	Trailing Edge Guide Plate	• Aligns the trailing edges of the paper stack in the Lower Feeder Unit.
[6]	Edge Guide Plate	• Aligns the edges of the paper stack in the Lower Feeder Unit.
[7]	Vertical Conveyance Roller	• Conveys the paper fed in from the Lower Feeder Paper Feed Roller into the inside of the machine.
[8]	Lower Feeder Separation Roller	• Separates paper in the Lower Feeder Unit. • Small-diameter roller with a torque limiter
[9]	Lower Feeder Paper Feed Roller	• Feeds paper from the Lower Feeder Unit.
[10]	Lower Feeder Motor (M1 PF)	• Drives the Lower Feeder Paper Feed Clutch (CL1 PF) and Vertical Conveyance Roller.
[11]	Lower Feeder Paper Feed Clutch (CL1 PF)	• Transmits drive from the Lower Feeder Motor (M1 PF) to the Lower Feeder Paper Feed Roller.
[12]	Lower Feeder Paper Feed Sensor Actuator	• Detects the paper fed in from the Lower Feeder Unit. • Detects the paper fed in from Tray 3 when two Lower Feeder Units are installed.
[13]	Lower Feeder Paper Feed Sensor (PC3 PF)	
[14]	Size Detection Board	• Detects the length of the paper loaded in the Lower Feeder Unit.
[15]	Lower Feeder Paper Size Switch (S1 PF)	
[16]	Empty Sensor Actuator	• Detects the paper still available for use in the Lower Feeder Unit.
[17]	Lower Feeder Paper Empty Sensor (PC1 PF)	

2. Drive



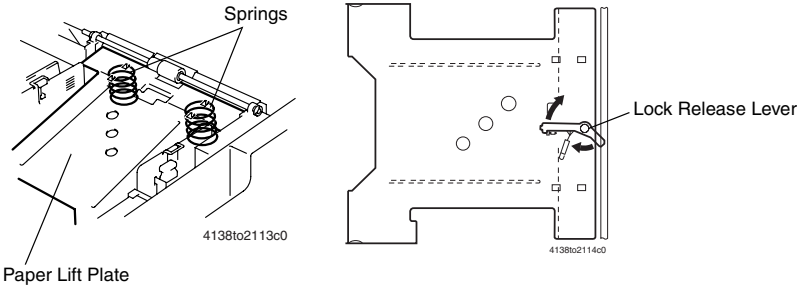
[1] Vertical Conveyance Roller
[2] Lower Feeder Separation Roller
[3] Lower Feeder Paper Feed Roller
[4] Lower Feeder Motor (M1 PF)
[5] Lower Feeder Paper Feed Clutch (CL1 PF)

3. Operations

3.1 Paper feed control

3.1.1 Paper Lift Plate mechanism

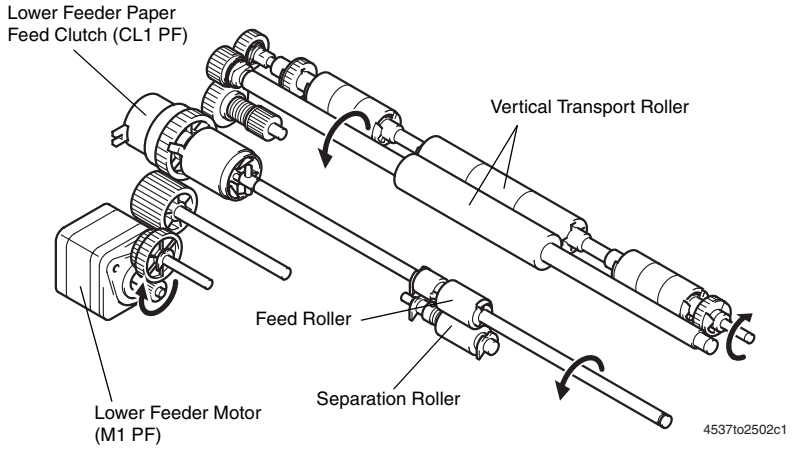
- The Paper Lift Plate is pressed down into the locked position (in which the paper is loaded in position).
- Load a paper stack and then slide the tray into the machine. This unlocks the Paper Lift Plate.
- The Paper Lift Plate (paper stack) is pressed against the Feed Roller.
- The Paper Lift Plate (paper stack) is pressed upward by the springs at all times.

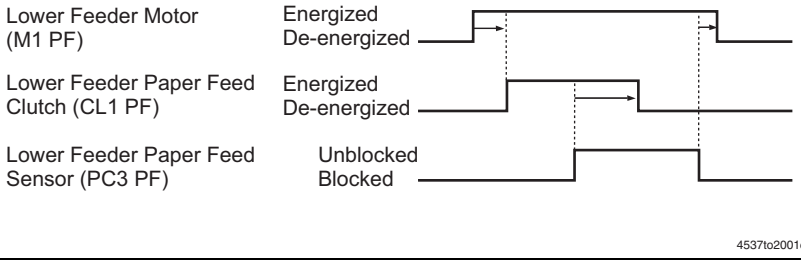


3.1.2 Feed Roller/Vertical Conveyance Roller control

- The Feed Roller and Vertical Conveyance Roller are rotated, which feeds paper from the Lower Feeder Unit and conveys it further into the inside of the machine.

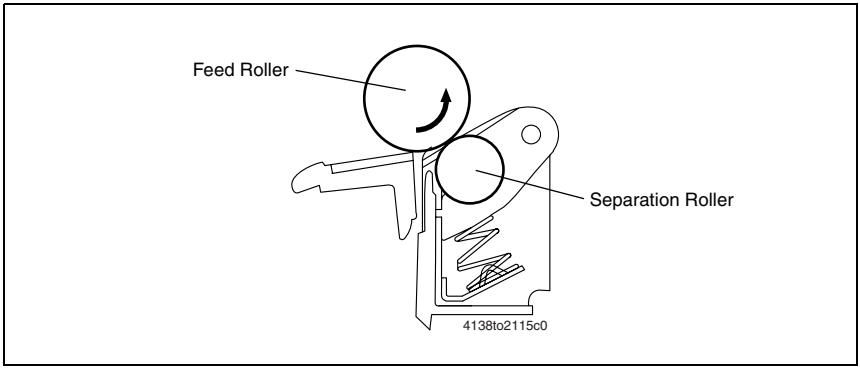
1. The Lower Feeder Motor (M1 PF) is energized to turn the Vertical Conveyance Roller.
2. The Lower Feeder Paper Feed Clutch (CL1 PF) is energized to turn the Feed Roller.
3. The paper is fed in by the Feed Roller.
4. The paper fed in by the Feed Roller is conveyed onto the Synchronizing Roller of the machine by the Vertical Conveyance Roller.
5. When the Lower Feeder Paper Feed Sensor (PC3 PF) is activated and then the paper is conveyed onto a predetermined point in the paper path, the Lower Feeder Paper Feed Clutch (CL1 PF) is de-energized, thus bringing the Feed Roller to a stop. The Vertical Conveyance Roller thereafter takes charge of conveying paper further.
6. When the trailing edge of the last sheet of paper moves past the Synchronizing Roller Sensor (PC4), the Lower Feeder Motor (M1 PF) is de-energized to bring the Vertical Transport Roller to a stop.





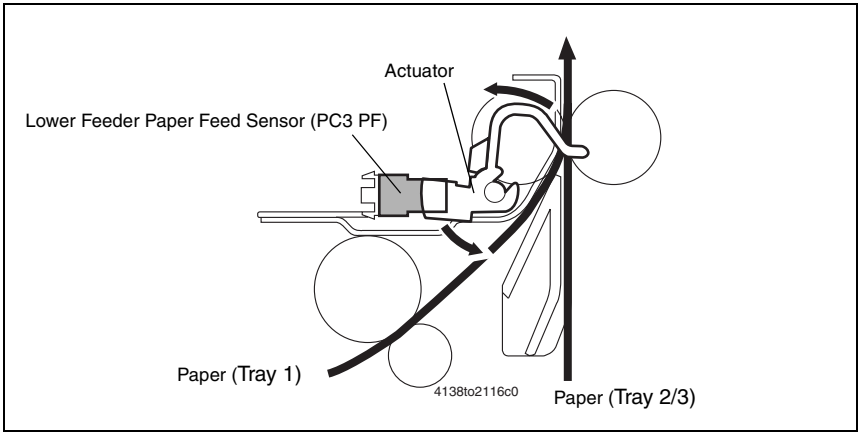
3.1.3 Paper separation mechanism

- A Separation Roller provided with a torque limiter is used to prevent double feeding of paper.



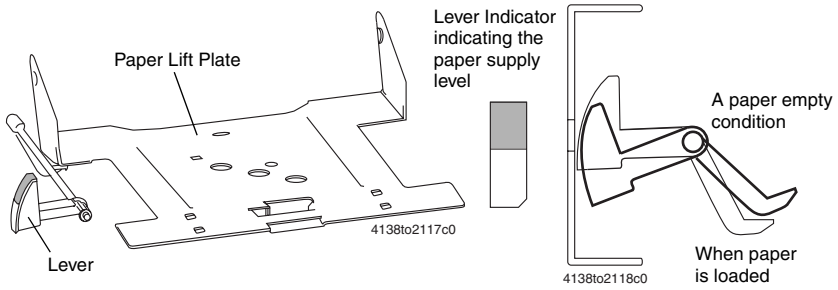
3.1.4 Paper detection mechanism

- The Lower Feeder Paper Feed Sensor (PC3 PF) detects the paper fed in by the Feed Roller.
- When two Lower Feeder Units are installed, the sensor detects the paper fed off from Tray 3.
- When the Lower Feeder Paper Feed Sensor actuator unblocks the Lower Feeder Paper Feed Sensor (PC3 PF), the machine considers that the paper has reached the sensor position.



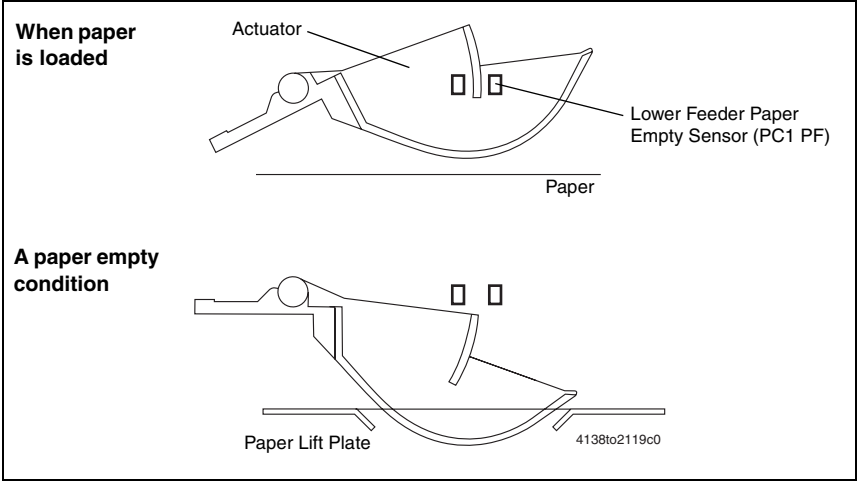
3.1.5 Paper supply level detection control

- There is a window in the front cover of the cassette for indicating the paper supply level.
- When the Paper Lift Plate goes up, a red lever appears in the window. The lower the level of the paper stack in the tray, the more red that is visible.



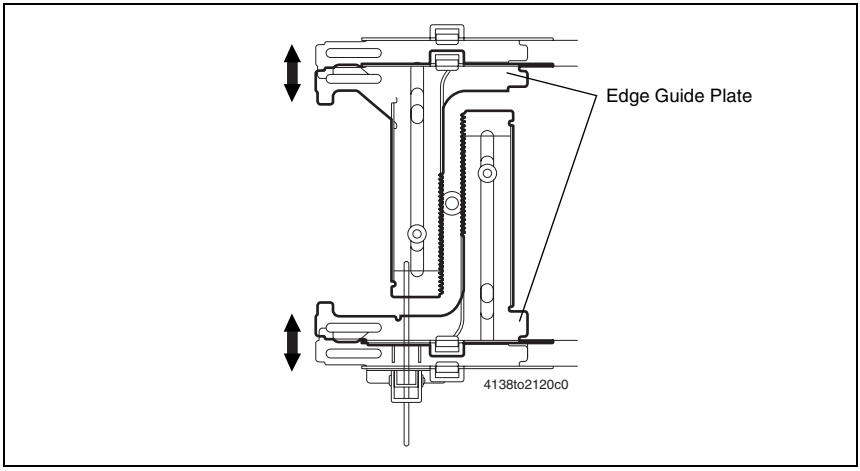
3.1.6 Paper empty condition detection control

- The paper empty message is displayed on the panel when the Empty Sensor Actuator unblocks the Lower Feeder Paper Empty Sensor (PC1 PF).
- No mechanism is provided for detecting a paper near empty condition. The paper supply level indicator serves this purpose.



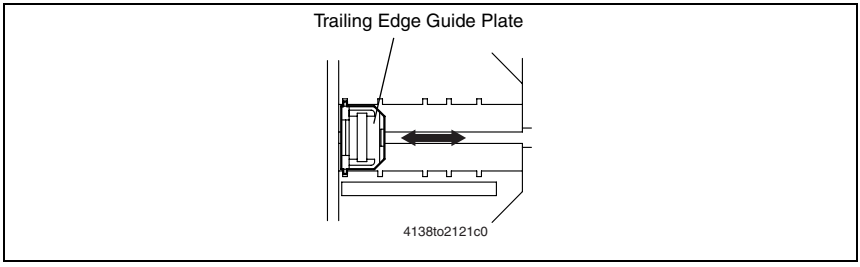
3.1.7 Edge Guide Plate

- The Edge Guide Plate can be slid to the exact size in the width direction of the paper to be loaded (A4, B5, 8/12).



3.1.8 Trailing Edge Guide Plate

- The Trailing Edge Guide Plate can be slid to the exact size in the length direction of the paper to be loaded (14 inch, 13 inch, $12^{7}/_{10}$ inch, A4, 11, $10^{1}/_{2}$ inch, B5).

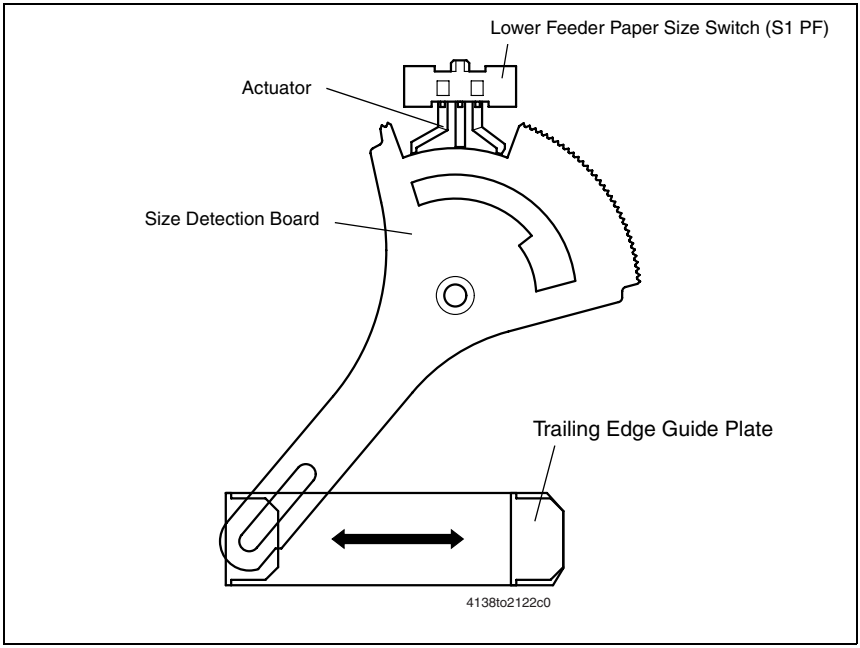


3.1.9 Paper size detection control

- The Lower Feeder Paper Size Switch (S1 PF) detects the length size (FD) of the paper.

1. The Size Detection Board turns as the Trailing Edge Guide Plate is moved.
2. When the tray is slid into the machine, the Size Detection Board pushes the actuator of the Lower Feeder Paper Size Switch (S1 PF) installed to the machine frame, thus turning ON the switch.
3. The combination of ON/OFF positions of the sub-switches of the Lower Feeder Paper Size Switch (S1 PF) determines the specific paper size that can be either one of the seven different sizes.
4. If the tray is not slid into position, all of the sub-switches are OFF and the message “DRAWER OPEN TRAY X” appears.

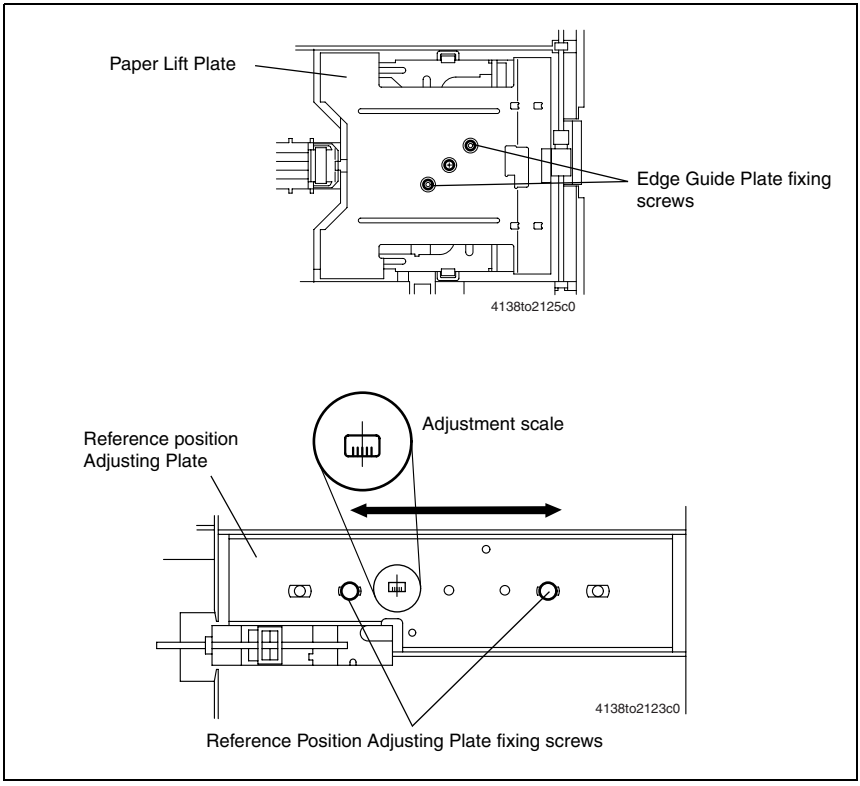
Lower Feeder Paper Size Switch			Paper size
SW1	SW2	SW3	
OFF	ON	ON	Legal (8.5” × 14”)
ON	ON	ON	Government Legal Letter Plus
ON	ON	OFF	A4
ON	OFF	OFF	Letter (8.5” × 11”)
OFF	OFF	ON	B5
ON	OFF	ON	Executive
OFF	OFF	OFF	Lower Feeder Unit not installed



3.1.10 Paper reference position adjustment mechanism

- The Edge Guide Plate can be moved to allow the print start reference position for the paper to be adjusted.

1. Through a hole in the Paper Lift Plate on top of the tray, loosen two screws that secure the Edge Guide Plate.
2. Accessing the tray from its bottom surface, loosen two screws that secure the Reference position Adjusting Plate.
3. Slide the Reference position Adjusting Plate as necessary as indicated on the scale.
4. From the bottom surface of the tray, tighten the two screws that secure the Reference position Adjusting Plate.
5. Through the hole in the Paper Lift Plate on top of the tray, tighten the two screws that secure the Edge Guide Plate.



3.1.11 Paper misfeed detection control

- If the Lower Feeder Paper Feed Sensor (PC3 PF) is not activated within a predetermined period of time after a paper feed sequence has been started, the machine determines that there is a paper misfeed. It then displays a paper misfeed message on the panel.
- The paper misfeed display can be reset by opening and closing any door.

KONICA MINOLTA

SERVICE MANUAL

THEORY OF OPERATION

Duplex Option

2005.04
KONICA MINOLTA BUSINESS TECHNOLOGIES, INC. Ver. 2.0

CONTENTS

I Outline

1. Product specifications 1-1
 - 1.1 Type 1-1
 - 1.2 Paper type 1-1
 - 1.3 Machine specifications 1-1
 - 1.4 Operating environment 1-1

II Composition/Operation

1. Overrall composition 2-1
2. Center cross section 2-2
3. Drive system 2-3
4. Mechanical operations 2-4
 - 4.1 Reversing mechanism 2-4
 - 4.1.1 Reversing operation 2-4
 - 4.1.2 Paper exit roller drive coupling mechanism 2-4
 - 4.1.3 Reverse Motor Control 2-4
 - 4.2 Conveyance and duplex paper feed mechanism 2-5
 - 4.2.1 Coveyance and duplex paper feed operation 2-5
 - 4.2.2 Duplex Unit Conveyance Motor Control 2-5
 - 4.3 2-sided printing method 2-6
 - 4.3.1 Operations in 2-sided printing with a single sheet of paper resident in the system 2-6
 - 4.3.2 Operations in 2-sided printing with two sheets of paper resident in the system 2-8

I Outline

1. Product specifications

1.1 Type

Name	Duplex Unit
Type	Reversing and Circulating Duplex Unit
Installation	Mounted on the right side door of the main unit
Document Alignment	Center

1.2 Paper type

Paper Type	Plain paper	60 g/m^2 to 90 g/m^2 (16 lbs to 24 lbs)
Paper Size	A4, B5T, Letter, Legal	

1.3 Machine specifications

Power Requirements	DC 24 V ± 10% (supplied from the main unit)
	DC 5 V ± 5% (supplied from the main unit)
Max. Power Consumption	17 W
Dimensions	394 mm (W) × 320 mm (D) × 58 mm (H) 15.5 inch (W) × 12.6 inch (D) × 2.3 inch (H)
Weight	Approx. 1.8 kg (4.0 lb)

1.4 Operating environment

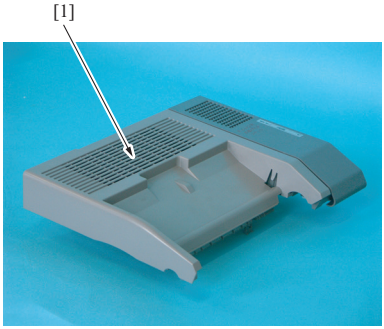
Temperature	10° to 30° C/50° to 86° F (with a fluctuation of 10° C/h (18° F/h))
Humidity	15% to 85% (with a fluctuation of 20%/h)

Note

- **These specifications are subject to change without notice.**

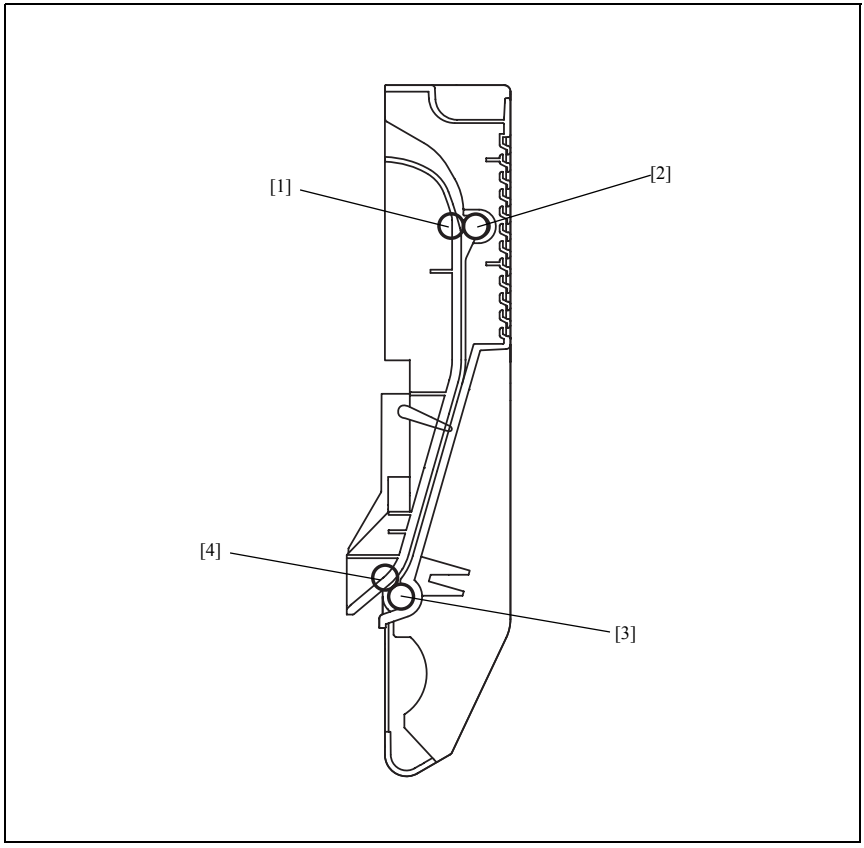
II Composition/Operation

1. Overall composition



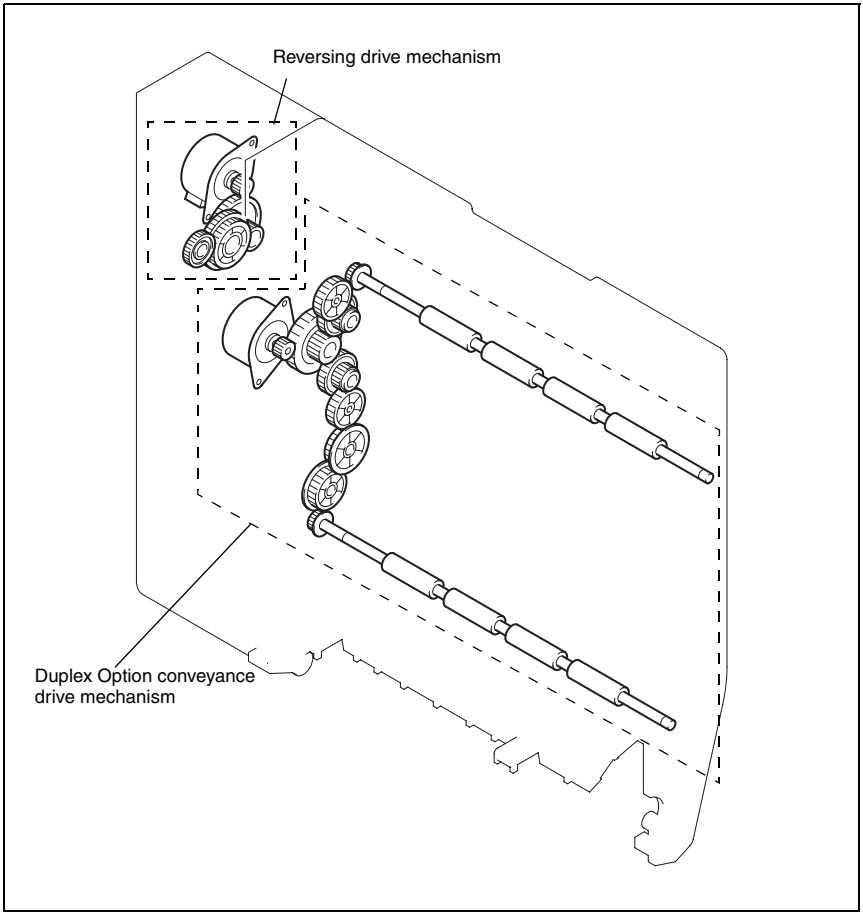
[1] Duplex Option Door

2. Center Cross Section



[1] Duplex Option Conveyance Roll 1
[2] Duplex Option Conveyance Roller 1
[3] Duplex Option Conveyance Roller 2
[4] Duplex Option Conveyance Roll 2

3. Drive System

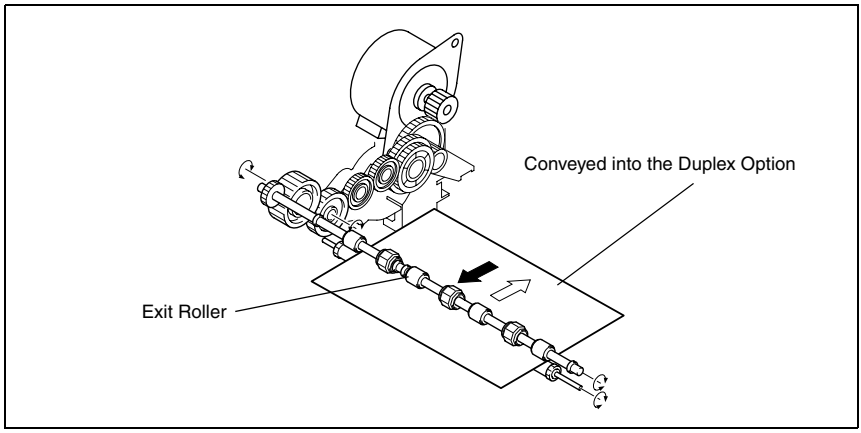


4. Mechanical Operations

4.1 Reversing mechanism

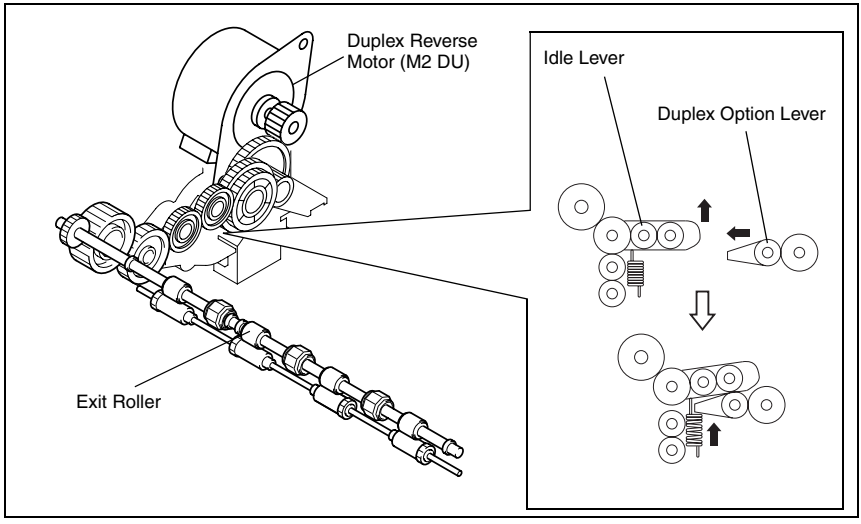
4.1.1 Reversing operation

- The 1-sided printed page is subjected to a reversing operation performed by the Exit Roller in the machine and conveyed into the Duplex Option.



4.1.2 Paper exit roller drive coupling mechanism

- When the Duplex Option is mounted, the leading edge of the Duplex Option Lever raises the Idle Lever, thus disconnecting the drive from the machine. The Exit Roller is driven by the Duplex Reverse Motor.



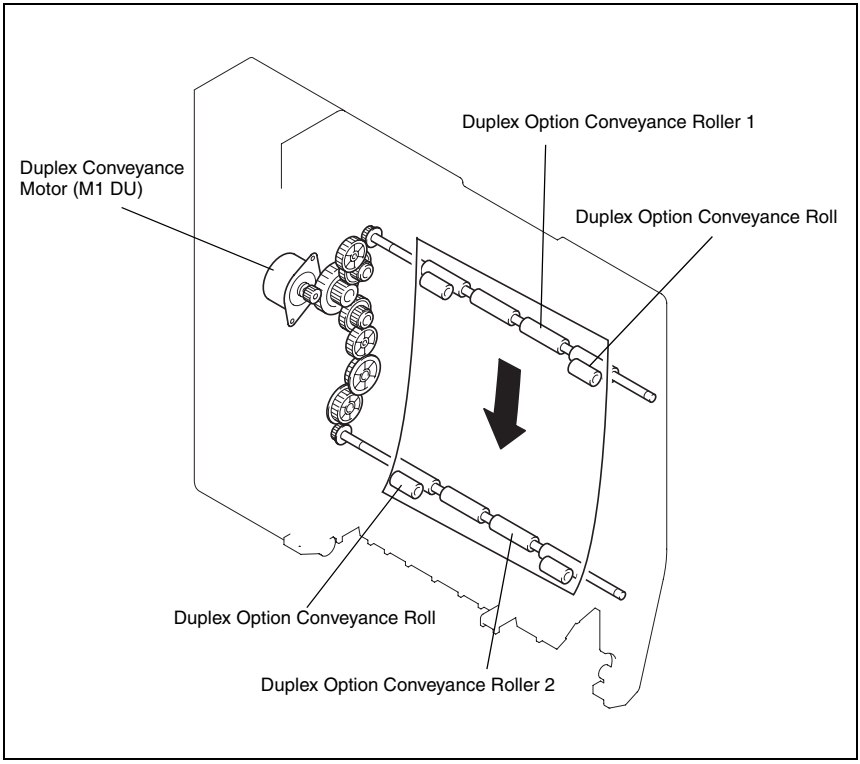
4.1.3 Reverse Motor Control

- The signal output from the Duplex Board is used to control rotation of the Duplex Reverse Motor.

4.2 Conveyance and duplex paper feed mechanism

4.2.1 Conveyance and duplex paper feed operation

- The Duplex Conveyance Motor provides the drive for the Duplex Option.



4.2.2 Duplex Option Conveyance Motor Control

- The signal output from the Duplex Board is used to control the rotation of the Duplex Conveyance Motor.

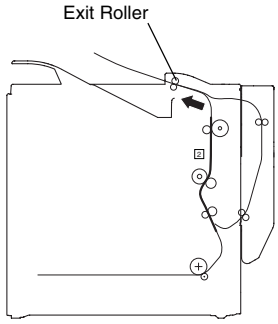
4.3 2-sided printing method

- The following two types of 2-sided printing methods are available.

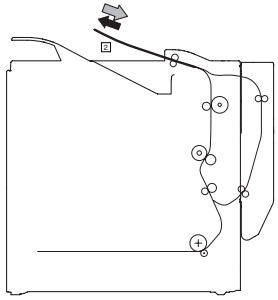
2-sided printing method
- 2-sided printing with a single sheet of paper resident in the system
- 2-sided printing with two sheets of paper resident in the system (for Letter and smaller sizes)

4.3.1 Process of 2-sided printing with a single sheet of paper resident in the system

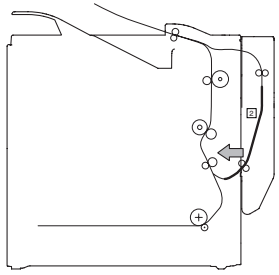
Operation 1
- A sheet of paper is fed in and the image of the second page of the print job is printed.



Operation 2
- Just before the 1-sided printed page moves past the Exit Roller, the direction of rotation of the Exit Roller is reversed and the 1-sided printed page is conveyed into the Duplex Option.

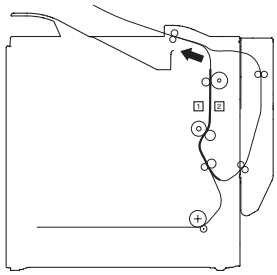


Operation 3
- The 1-sided printed page being transported through the Duplex Option is stopped briefly and then fed into the machine.



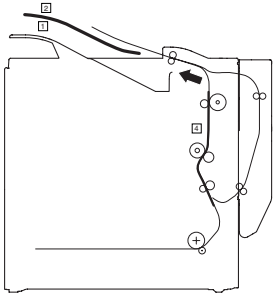
Operation 4

- The image of the first page of the print job is printed on the 1-sided printed page fed out of the Duplex Option.



Operation 5

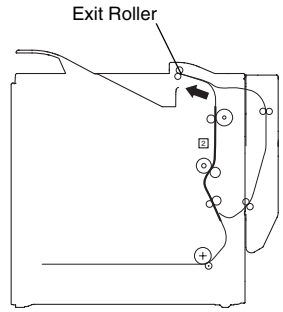
- As the 2-sided printed page is being fed out of the machine, the image of the fourth page of the print job is printed on the second sheet of paper.



- Steps 2 through 5 are repeated until all pages of the job are printed.

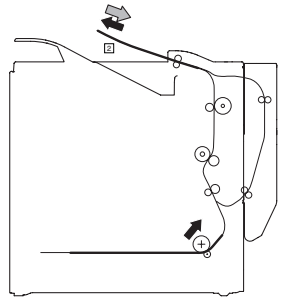
4.3.2 Process of 2-sided printing with two sheets of paper resident in the system

Operation 1
- The first sheet of paper is fed in and the image of the second page of the print job is printed.



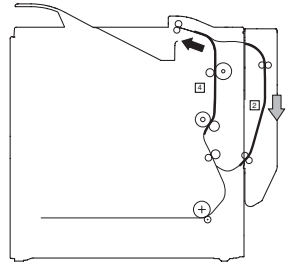
4538to2502c1

Operation 2
- Just before the 1-sided printed page moves past the Exit Roller, the direction of rotation of the Exit Roller is reversed and the first 1-sided printed page is conveyed into the Duplex Option.
- The second sheet of paper is fed alongside.



4538to2513c1

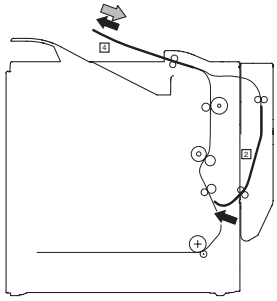
Operation 3
- The first 1-sided printed page is conveyed through the Duplex Option.
- The image of the fourth page is printed on the second sheet of paper fed alongside.



4538to2514c1

Operation 4

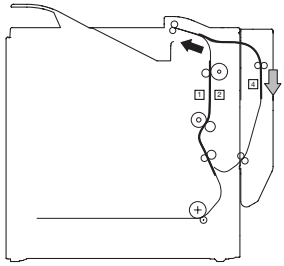
- Immediately before the second sheet of paper exits the feed roller, the rotating direction of the feed roller changes and the second sheet of paper is transported into the Duplex Option.
- The first sheet of paper is fed alongside again. The second sheet of paper is fed



4538to2515c1

Operation 5

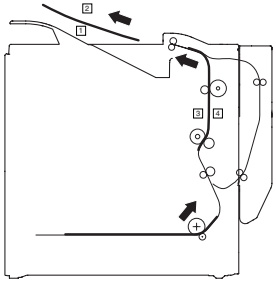
- The image of the first page is printed on the first sheet of paper as it is fed again.



4538to2508c1

Operation 6

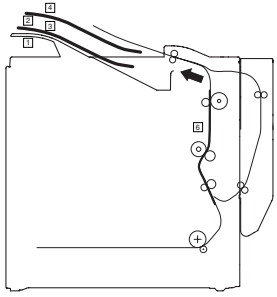
- The image of the third page is printed on the second sheet of paper as the first sheet of paper is discharged.
- The third sheet of paper is fed alongside.



4538to2509c1

Operation 7

- As the second sheet of paper is fed out of the machine, the image of the sixth page of the print job is printed on the third sheet of paper.
- Steps 6 through 7 are repeated until all pages of the job are printed.





© 2005 KONICA MINOLTA BUSINESS TECHNOLOGIES, INC.

Use of this manual should be strictly supervised to avoid disclosure of confidential information.

Printed in Japan
4138-7990-31